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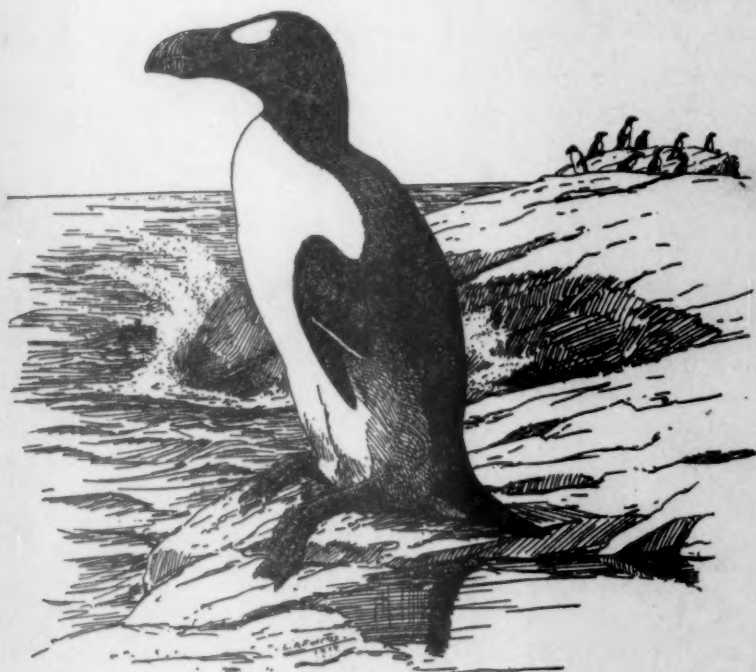
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J. H. Riley

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IN MEMORIAM: JOSEPH HARVEY RILEY

BY ALEXANDER WETMORE

Plate 1

JOSEPH HARVEY RILEY, Fellow of the American Ornithologists' Union since 1919, departed this life on December 17, 1941, at the age of 68 years, 2 months and 28 days. Born in Falls Church, Virginia, on September 19, 1873, he was resident throughout his time in the family home, except for occasional absences in the field. His entire life was centered in his work in the United States National Museum under the Smithsonian Institution, where for forty-five years he was a member of the staff in the Division of Birds, faithful and conscientious in his application to his work.

Regarding his ancestry, his father, Joseph Schleick Riley, was born near Indianapolis, Indiana, in 1835, and, as a young man, came east to Washington with a sister to reside in that general vicinity until his death in 1919. For a number of years he engaged in a book business located on 7th Street in Washington, until with failing health, his physician recommended a residence farther south. Leaving the store in Washington in other hands, he removed to Richmond, Virginia, where he established a similar business, and also engaged in the sale and export of leaf tobacco. The mother, Mary Edwards Pultz, was born and lived during her childhood near Smithfield, Jefferson County, formerly in Virginia but now a part of West Virginia. This town, locally called 'Clip' because of a once widely known tradition concerning a haunted house there, is now named Middleway. Many men of her large family connection entered the Confederate Army during the War between the States, the local saying being that there were enough Bells to form a regiment.

In the course of his business activities, the elder Riley in 1872 acquired a property of about 80 acres in Falls Church, Virginia, then a small community centered around a church, a tavern and one or

two stores a few miles west of Washington. This farm was known in early days under the name of 'Cherry Hill,' from a fine avenue and other plantings of huge old cherry trees lining the roadway leading to the house. Tradition says that the place was established originally by an Englishman named Harvey, who not only planted the cherries but also brought in other trees and shrubs from foreign lands. On this farm Harvey Riley lived during his boyhood, and here, as a child, he developed that interest in natural history, particularly in birds, that grew to form his career. Falls Church, at that time, was located on a branch of the Southern Railroad which later became the Old Dominion Railway. After early schooling in his native town, Riley attended one year of high school in Washington, followed by two years in a preparatory school known as the Emerson Institute, on 14th Street opposite the present location of the Franklin School. On his graduation from the Institute, he was awarded a silver medal for his scholarship, but, due to a diffidence characteristic of him throughout his life, he did not attend the graduating exercises, so that the medal (which had the date 1895 inscribed upon it) was later brought to him in Falls Church by Dr. Young, head of the school.

Like many other naturalists, Riley's boyhood interest in all wild things centered early in the formation of a collection of birds' eggs, and it was no doubt this interest that brought him during his school days in Washington to the Smithsonian Institution, where he met Robert Ridgway, the beginning of a lifelong friendship, and had opened to him the world of birds. Charles Bendire then was working on his 'Life Histories of North American Birds,' Ridgway was preparing the data for his first volumes of the 'Birds of North and Middle America,' and Leonhard Stejneger, though then Curator of Reptiles, was actively interested in ornithology. On August 17, 1896, Harvey Riley came to the National Museum on a temporary appointment as an Aid to assist in work on the collection of eggs of North American birds. Because of shortage of funds, the salaried appointment ended on November 14 of the same year, but Riley's interest was such that he continued to work in the Museum except when prevented by duties at home. Another temporary appointment came December 7, 1897, continuing until July 8, 1898, when he received the status of Aid as a regular member of the staff in the Division of Birds. On July 1, 1928, he became Assistant Curator of the Division, and on June 24, 1932, he was advanced to Associate Curator, a title that he held until his death.

When Dr. W. L. Ralph became custodian of the collection of

birds' eggs, following the death of Bendire, Riley served as his assistant, arranging the collections, incorporating new material, and expanding the series as needed. As this work lessened in amount, he began to assist Robert Ridgway and to work with skins. As Ridgway's assistant, it fell to Riley to make the long series of measurements found in the early volumes of the 'Birds of North and Middle America,'—work that he performed with the most painstaking care that insures their accuracy. He started also a small collection of bird skins of his own, stimulated by the field activities of Ridgway, Richmond, William Palmer, and others who were working in local ornithology at the time. He also had close association at this time with members of the Washington Biologists' Field Club, an organization to which Riley was elected a member on June 3, 1901, when it was decided to move the site of the club to its present location on Plimmers Island in the Potomac River above Washington.

Unlike many naturalists, Riley published no boyhood notes, his first paper on Stephens's Whip-poor-will, which appeared in the 'Osprey' for July, 1901, being a serious discussion of what was then known of this bird, its nesting, and its status. A footnote indicates that this was "published by permission of Dr. W. L. Ralph." The following year, for the same journal, he prepared original observations on the nesting of the Broad-winged Hawk in the Washington region, illustrated with a photograph taken by Paul Bartsch of a nest containing two eggs. Immediately then Riley began publication of the notes and descriptions in technical ornithology that continued throughout his life.

His first expedition of note came in 1900 when, from February to August, as assistant to William Palmer of the National Museum, he made collections of birds in Cuba. After a few days about Matanzas and Habana, the two men proceeded to the Province of Pinar del Río, where they were occupied until the end of June. In July, they worked at Batabanó, and also crossed to the Isle of Pines, spending seventeen days on that island. In addition to birds, they collected other animals and plants. The two planned a complete report on the birds obtained, but because of various interruptions this never progressed beyond the stage of a few notes in rough manuscript, and the project was finally abandoned. Quite naturally, this first journey to a foreign country aroused in Riley a deep interest in the avifauna of the West Indies that gave direction to his studies and to his publications for many years. In fact, he assembled much data in card form with the idea of preparing a check-list of the birds of the West

Indies, but in the end used the material only to assist in the writing of various faunal papers.

It was not long until he had opportunity for another visit to the West Indies, as in June and July, 1903 he was detailed to accompany an expedition of the Geographic Society of Baltimore to the Bahama Islands, for which he was designated in charge of the Division of Land Zoology. With Samuel H. Derickson, then a student at Johns Hopkins University, as assistant, collections of reptiles, birds and mammals were made for the U. S. National Museum. Dr. George B. Shattuck, then Associate Professor of Physiographic Geology in the Johns Hopkins University, was Director of the expedition, which covered studies ranging from geology and botany to sanitary conditions in the islands. The party sailed from Baltimore June 1 on the schooner *Van Name* and, after a stormy voyage, reached Nassau June 17. Zoological collections were made on New Providence, Green Cay, Andros, Eleuthera, Cat Island, Rum Cay, Watling's, Long Island and Abaco. On July 22, the party sailed for the north. As usual in such expeditions, the time ashore was curtailed due to the type of transport, but the notes on birds published in the volume on the expedition, and in more detail in 'The Auk,' contain many matters of interest. The reptiles obtained were identified by Dr. Leonhard Stejneger, and the mammals by Gerrit S. Miller, Jr.

In 1910, from May 10 to 20, with William Palmer and Paul Bartsch, Riley collected on Smith's Island on the Virginia coast at the time of the shorebird migration. And the following year, with Dr. E. A. Mearns and E. J. Brown, he made a more extended excursion to South Carolina, the three men being located from April 20 to May 10 across from Charleston. The excursion was planned to secure for the National Museum birds for which Charleston or South Carolina was the type locality, and in this the three naturalists were highly successful. Much of their work was done in the area adjacent to the home of the ornithologist, Arthur T. Wayne, who joined them in many of their days afield, and with whom Riley formed an enduring friendship.

Almost immediately on returning from this excursion, Riley was detailed to accompany Ned Hollister on an expedition sponsored by the Alpine Club of Canada to make a general survey of the fauna and flora of Jasper Park, Yellowhead Pass, and the Mount Robson region in western Canada. Hollister and Riley left Washington June 24 and proceeded to Edmonton, Alberta, where A. O. Wheeler, Director of the Alpine Club and leader of the party, joined them on June 30.

The following day they left Edmonton on the Grand Trunk Pacific, and, on July 2, with living quarters in a boxcar placed for them on a siding, began work on Prairie Creek, a tributary of the Athabaska River. The night of July 3, their car was moved to Brule Lake, seven miles east of Jasper House, where a pack train was organized July 5. They made their next stop at the abandoned site of Henry House, well known to earlier travellers, where they remained until July 9, and then continued through Yellowhead Pass into British Columbia, following down the Fraser River to the mouth of Moose River. They located here on the west fork of the Moose near Reef Glacier, where they remained until July 19, and then crossed to the east fork of the Moose to remain for another five days. The route followed from here led them through Moose Pass, where Hollister and Riley remained in camp in the edge of the fir timber until August 7. They returned to the mouth of Moose River, secured a team, and moved near Moose Lake to collect until August 28. This was followed by a few days at Yellowhead Lake and a return to Henry House, where they collected until September 22, when they left by train for Edmonton. From his specimens secured during these investigations, Riley described as new, races of the Song Sparrow and Fox Sparrow, and was led to make a detailed study of the White-tailed Ptarmigan. He often remarked on the relative scarcity of birds in the area visited and on the small number of individuals of many of them. His paper including the notes on this expedition, published in 1912 in a special number of the *Canadian Alpine Journal*, gives records for 78 species of birds.

For another twenty years, Riley remained active in weekend outings around his home, but the Canadian trip was his last extended expedition. He had built up a small local collection, beginning in 1897, and in 1902 turned this over to the Museum, adding other specimens from time to time. In the earlier years, there were relatively few collectors of birds in the Middle East and Southeast in the United States, while there was regular demand for birds from this area on the part of workers in other regions. Selection of specimens for these exchanges fell usually to Riley, who made a practice of selecting his own skins to send out, so that his collecting brought many valuable birds to the Museum in addition to his local records. He enjoyed making such exchanges, and made a point of collecting birds specially desired by correspondents, the skins received in return being placed in the Museum collections. These exchanges brought specimens from such widely separated points as Argentina and Bavaria. He also

collected a few mammals for use in this manner. As a preparator, he was skillful and fairly rapid, his skins being symmetrical and carefully made. His specimens are marked by a narrow, black-bordered label of a style popular among local ornithologists at the time when he began his work.

Though I first saw Harvey Riley during a visit to the Division of Birds in September, 1908, on that occasion we exchanged only a few brief words. Our real acquaintance began in November, 1911, when for a few weeks I spent considerable time in the Museum in preparation for work in the field in Puerto Rico. Our mutual interests in birds, in books about them, and in the many absorbing details that bring happy communion between naturalists, resulted immediately in a mutual regard that was the foundation for our long friendship. And for years during periods when I was in Washington, usually from late fall to early spring, in addition to our contacts in the Museum, we made many trips afield together in search for specimens. Ordinarily, these started at Riley's house in Falls Church, which I could reach by early morning trolley from Washington. The great cherry trees that had given the farm its name mostly were gone, but we invariably admired a huge sour gum tree at the border of a field below the house, a tree that Robert Ridgway often said was the finest one of its kind that he had ever known, or some of the many other interesting trees and shrubs on the Riley place. By that time, Falls Church had grown to a fair-sized town, so that the Riley acres were bordered by town development that grew on all sides. However, we could cross through a lower field and by trails that avoided houses, proceed past Horseshoe Hill to forested areas along Holmes's Run, and many were the interesting birds that we encountered. There were occasional Ruffed Grouse in one stand of woodland, hawks were seen in reasonable numbers, and there were unusual records among the smaller birds. Riley's own experiences here carried him back to days when the Wild Turkey still nested in the area. In afternoon we returned for Sunday dinner in Riley's home with his mother and other members of the family whose friendly hospitality on my first meeting with them put me immediately at ease from the momentary embarrassment brought to me by my appearance at table in hunting clothing. Many were the birds we saw and collected on these pleasant occasions, and many were the ideas and tales that we exchanged on our work in ornithology.

In his more active years, Riley enjoyed greatly the sport of hunting, particularly of quail and, until middle age, had always one to sev-

eral bird dogs whose training and handling gave him much recreation and pleasure during leisure hours. He also was interested at one time in trap shooting and was a good clay pigeon shot. Local hunting trips were the program for the weekend during the season, and usually each year he had a few days farther afield, elsewhere in Virginia or in West Virginia. The amount of game secured on these excursions was never large, but always there came much pleasure from the fact of being afield.

As years passed and the town of Falls Church grew in size, the original farm that made the Riley home was reduced in acreage, though the land holding of the family remained considerable. Riley's father died in 1919 and his mother followed in 1927, when Harvey Riley inherited the old home with a tract of 8 acres of land. The original property of Cherry Hill had many plantings of unusual trees and shrubs, and Riley's boyhood interest in these was enhanced by his association with Robert Ridgway, Curator of Birds in the National Museum, who was an ardent horticulturist. Flowers and shrubs absorbed much time with Harvey Riley, sometimes on the excuse of getting some return from otherwise idle land, but ordinarily merely for the pleasant hours that they provided in their care and contemplation. The grand old boxwood at the house led him to establish nurseries of this ornamental in which he grew hundreds of cuttings. He also developed a great garden of gladiolus followed by a similar extensive planting of peonies and roses both including many fine varieties. Various of these enterprises were planned as money-making ventures, and he did sell many flowers from them. Actually, to his closest friends, these activities were mainly an expression of his love of things outdoors that in financial return repaid only part or none of the money invested. In addition to those mentioned, he planted many other shrubs and flowers that made his grounds a place of never-failing interest to his visitors. In his later years, his daylight hours away from the office were occupied with his yard and gardens, especially his roses, where naturally, the development of the grounds brought a bird population that was always of delight to him.

In the Museum for years Riley assumed much of the routine care of the bird collection, devoting his remaining time to his scientific studies. As has been indicated above, his early interest was in the West Indies, fostered by his two expeditions in that area. With the steady receipt of collections from other parts of the world, it was natural that as he handled the many unusual birds, he was attracted to them. A fine collection from Celebes made by H. C. Raven through

the interest of Dr. W. L. Abbott was the source of important studies leading to a report on the area. This led to work on other Eastern collections brought by Dr. Abbott as well as on the Chinese materials that came from the travels of Dr. Joseph F. Rock in Yunnan and Szechwan under the auspices of the National Geographic Society, and from another expedition by F. R. Wulsin under the National Geographic to Inner Mongolia, Kansu and Chihli. About this time, Dr. David C. Graham began sendings of birds from western China and eastern Tibet that continued for years, and that brought scores of species new to the Museum and new to science. The study of these fell to Riley and led to a number of papers. Later, there came extensive research and publication on the fine collections from Thailand secured for the Museum by Dr. Hugh M. Smith. A report on these materials, including earlier specimens from W. L. Abbott, published as Bulletin 172 of the U. S. National Museum in 1938, is Riley's most comprehensive paper. His final contributions were short papers on new birds from southern Annam and Indo-China, the last appearing on November 8, 1940.

In his technical studies covering the forms of birds, their names, and their geographic distribution, which was the main field of his writings, Riley showed keen discrimination, his identifications being carefully made, while his deductions in nomenclature were sound. In the course of his forty years of such studies, he proposed fifteen new generic terms and 128 species and subspecies of birds, and named 3 additional forms in collaboration with William Palmer. Some of these proposals were brought about through his observation of pre-occupied names, but the greater part were novelties made known to science for the first time through the collections that passed through his hands. That few of the names that he proposed have been put in synonymy is indication of his sound and conservative judgment. His bibliography includes 116 titles, all carefully noted in one of his record books, that includes also a list of the genera, species and subspecies of birds that he described.

Dr. Stejneger named an iguana from the early expedition in the Bahamas *Cyclura rileyi* in his honor, and Gregory Mathews proposed the genus *Rileyornis* for him. The following subspecies of birds have commemorated his name:

Broderipus chinensis rileyi Mathews

Coracina temminckii rileyi Meise

Coccyzus minor rileyi Ridgway

Myiophonus caeruleus rileyi Deignan

Stachyris nigriceps rileyi Chasen

Strix indranee rileyi Kelso

Pipilo alleni rileyi Koelz

Joseph Harvey Riley was a man of athletic form, above average height—he stood 6 feet, 1 inch and weighed 170 pounds—who, in his later years, acquired the slightly stooped shoulders common to laboratory workers. From his earliest childhood and throughout his entire life he was known for his absolute truthfulness, and he was marked always by an innate courtesy and consideration that was expressed constantly in his contacts with others. With entire unselfishness, he devoted much time to the inquiries of correspondents, and visitors to the Division of Birds were given the fullest attention and assistance. While congenial among his friends and one who enjoyed to the utmost conversations with visitors and with his companion workers, he had, at the same time, a diffidence that kept him from any public appearance. When the American Ornithologists' Union held its annual meeting in Washington, he was always one of those who assisted in the arrangements, but he withdrew from any situation that might call on him to speak, and during my own experience, I never saw him take part in any public program. This same diffidence kept him away from dinners and other similar functions, and he would not consent to holding office in any of the scientific societies that might entail his appearance before an audience. In conversation among his colleagues however, he held long and vigorous arguments on matters of his interest, and did not hesitate to advance strong and definite opinions. He will be remembered always for his friendly reception of those who came to him, and for his many courtesies large and small among those with whom he was in daily contact.

Riley was elected an Associate of the American Ornithologists' Union in 1897, became a Member in 1905, and a Fellow in 1919. While he attended very few meetings,—none in his later life—he was for years a member of the Biological Society of Washington, in which he served on the editorial committee for a considerable period. He joined the Cooper Ornithological Club in 1909, and became an active member of the Wilson Ornithological Club in 1914. For a number of years, he was interested in the Washington Biologists' Field Club, but finally withdrew from the organization because of the difficulties attendant on reaching the site of the Club at Plummers Island from his home in Virginia. He was also a member of the Baird Ornithological Club, though as he became more inactive in later life, he

gave up attendance at the meetings. He held membership in the American Forestry Association, the Wild Flower Preservation Society, the American Rose Society, the Potomac Rose Society, the Southern Historical Association, the American Society of Mammalogists, the American Society of Ichthyologists and Herpetologists, the Tennessee Ornithological Society, and the Virginia Society of Ornithology. He was also a Master Mason and at one period was diligent in attendance at Masonic meetings. He was interested in civic affairs in Falls Church, and contributed generously in various local enterprises but, as has been indicated previously, was too diffident by nature to take more active part.

Like most ornithologists of his day, Riley was deeply interested in books and separata dealing with birds, and with travel and natural history in general. In his later years in the long evenings that he spent always at home, he devoted much time to general reading, especially in history, and also before the advent of radio programs built up a large set of phonograph records of classical music that afforded him much pleasure. He also assembled a valuable collection of publications dealing with the War between the States, which with his general works, remains in the hands of his family. His scientific books he gave to the Library of the University of Virginia at Charlottesville, sending many of them there during his later years, as he realized the dangers of possible fire where such collections are kept in the ordinary private home. His will bequeathed the remainder of his library on natural history, including gardening and botany, to the University, where it forms one of the most important collections of its kind in any library in the south. To this bequest, the family has added his books of travel, a valuable adjunct to the scientific publications. A further section in Riley's will made provision for funds toward the founding of a Chair in Vertebrate Zoology at the University of Virginia.

He is survived by four sisters, Mrs. Margaret Riley Parker, Mrs. Kathleen Maude Gage, Mrs. S. H. Styles and Mrs. H. C. Birge. Harvey Riley never married, and except for his absences on field excursions, lived his entire life in the same house in which he was born. His death came from hypertensive heart disease following a period of several years during which he was failing steadily, though seldom was he absent from the Museum because of illness. His funeral was held from his well-loved house on December 19, 1941, with burial in Oakwood Cemetery in Falls Church.

My own association with him has led me to picture him always

against the background of the offices and laboratories of the Division of Birds, and of the fine old place in Virginia that was his home, and it is thus that I shall always remember him, a kindly, friendly man of unflinching courtesy, whose entire life was devoted to the science of ornithology.

THE PUBLISHED WRITINGS OF J. H. RILEY

1. Stephens's Whip-poor-will, *Antrostomus macromystax* (Wagler). *Osprey*, 5: 101, July, 1901.
2. Notes on the habits of the Broad-winged Hawk (*Buteo platypterus*) in the vicinity of Washington, D. C. *Osprey*, 6: 21-23, 1 plate, February, 1902.
3. Note on the name of Audubon's Shearwater. *Auk*, 19: 195, April, 1902.
4. Descriptions of three new birds from Cuba and the Bahamas (with William Palmer). *Proc. Biol. Soc. Washington*, 15: 33-34, March 5, 1902.
5. The authority for the name *Geotrygon chrysis*. *Auk*, 19: 397, October, 1902.
6. Description of a new Quail-Dove from the West Indies. *Proc. Biol. Soc. Washington*, 16: 13-14, February 21, 1903.
7. A new subspecies of Nighthawk from the Bahama Islands. *Auk*, 20: 431-433, October, 1903.
8. The Snowy Plover in the Bahamas. *Auk*, 20: 433, October, 1903.
9. The second known specimen of *Centurus nyeanus* Ridgway. *Auk*, 20: 434, October, 1903.
10. A new species of large Iguana from the Bahama Islands (with Leonhard Stejneger). *Proc. Biol. Soc. Washington*, 16: 129-132, October 17, 1903.
11. On the evanescent ground-tint of Woodcock's eggs. *Auk*, 21: 384, July, 1904.
12. Note on the generic names *Bellona*, *Orthorhynchus*, *Chrysolampis* and *Eulampis*. *Auk*, 21: 485-486, October, 1904.
13. On the proper name of the Tody of Jamaica. *Auk*, 21: 486, October, 1904.
14. Description of a new *Myiarchus* from Grenada and St. Vincent, West Indies. *Smiths. Misc. Coll.*, 47, pt. 2: 275-276, November 9, 1904.
15. Catalogue of a collection of birds from Barbuda and Antigua, British West Indies. *Smiths. Misc. Coll.*, 47, pt. 2: 277-291, November 9, 1904.
16. Birds of the Bahama Islands. In, 'The Bahama Islands,' The Geographical Society of Baltimore: 347-368, 1905 (March or April).
17. Mammals of the Bahama Islands (with Gerritt S. Miller). In, 'The Bahama Islands,' The Geographical Society of Baltimore: 371-384, 1905 (March or April).
18. On the correct name of the Mountain Thrush of the Lesser Antilles. *Proc. Biol. Soc. Washington*, 18: 186, June 29, 1905.
19. A new subspecies of Ground Dove from Mona Island, Porto Rico. *Proc. U. S. Nat. Mus.*, 29: 171-172, September 30, 1905.
20. List of birds collected or observed during the Bahama Expedition of the Geographical Society of Baltimore. *Auk*, 22: 349-360, October, 1905.
21. Descriptions of three new birds from the Merida Region of Venezuela. *Proc. Biol. Soc. Washington*, 18: 219-222, October 17, 1905.
22. A new name for Lewis' Woodpecker. *Proc. Biol. Soc. Washington*, 18: 224-225, October 17, 1905.
23. Notes on the Broad-winged Hawks of the West Indies, with description of a new form. *Auk*, 25: 268-276, July, 1908.

24. Filipino Snipe. Field and Stream, March, 1909: 991.
25. On the name of the Antillean Killdeer. Proc. Biol. Soc. Washington, 22: 88, April 17, 1909.
26. On the name and synonymy of the Antillean Sharp-shinned Hawk. Proc. Biol. Soc. Washington, 23: 77-78, May 4, 1910.
27. On the name of the Trinidad *Coereba*. Proc. Biol. Soc. Washington, 23: 100, May 27, 1910.
28. On the correct name of the Inca Tern. Proc. Biol. Soc. Washington, 24: 38, February 24, 1911.
29. Description of a new *Dryonastes* from China. Proc. Biol. Soc. Washington, 24: 43-44, February 24, 1911.
30. Descriptions of three new birds from Canada. Proc. Biol. Soc. Washington, 24: 233-236, November 28, 1911.
31. A new name for *Tanagra sclateri* Berlepsch. Proc. Biol. Soc. Washington, 25: 185, December 24, 1912.
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THE STATUS OF THE CALIFORNIA GULL

BY ALLAN BROOKS

Plate 2

MANY authorities are now reducing the status of the California Gull, *Larus californicus* Lawrence, to a subspecies of the Herring Gull, *Larus argentatus* Port.; even Dwight in his monumental work, 'The Gulls of the World,' regards it as closely related to the Herring Gull. The present writer has long been waiting for some one who is familiar with the California Gull in life to refute this contention. It may be that someone has, but if so it has not come to my notice.

The present paper is a summary of the reasons for considering it to be a very definite and distinct species with affinities as close to *delawarensis* and other species of the green-footed gulls as to the *argentatus* group. The distinctions are based upon: (1) voice; (2) color of the soft parts; and (3) the age at which it matures.

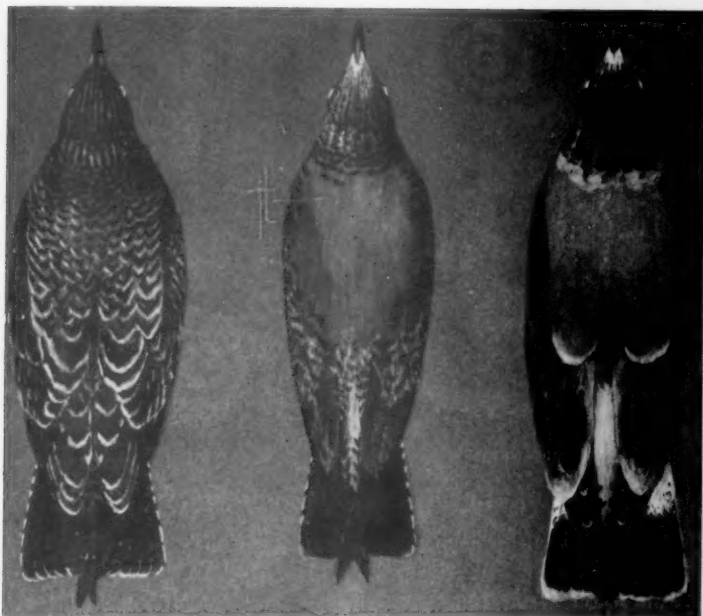
VOICE.—All the large gulls of the *hyperboreus*, *glaucescens*, *argentatus*, *fuscus*, *occidentalis*, *dominicanus* type that I have met in life have calls that are for the most part musical. The smaller gulls, *delawarensis*, *canus*, etc., have guttural and quacking calls, *heermanni* the hoarsest of them all. The voice of *californicus* is intermediate, much hoarser and less musical than that of *argentatus*. The arrival of the California Gulls in the spring in British Columbia is at once attested by their harsher voices among those of the wintering Herring Gulls.

SOFT PARTS.—The green or yellow feet of the California Gull are recognized as a field mark to distinguish adults in life from those of the Herring Gull group, but far more significant is the color of the gape and mouth. All the large gulls have these parts pallid flesh color, almost white; in *californicus* the adults have them deep orange as in *delawarensis* and *canus*. In the breeding season the color of the gape and tongue deepens to vermilion orange, the rest of the mouth paler orange; the eyelids are deep red. The general color of the bill in adults is as in *argentatus*, attaining even a deeper orange yellow than in that species and with the same scarlet blotch on the angle of the mandible, but a black transverse bar somewhat like that of *delawarensis* is always retained as well.

Judging by the color of the feet, gape, mouth and eyelids, *californicus* follows *delawarensis*; the bill color is closer to that of *argentatus* with one character of *delawarensis*.

MOLTS.—Dr. Dwight classes the California Gull with the Herring Gulls in having a three-year cycle before attaining adult plumage. With all deference to so great an authority I must regard this as an error in the case of the bulk of individuals of *californicus*. This conclusion is reached from the study of the birds in life over a long period as well as upon the skin material I have examined.

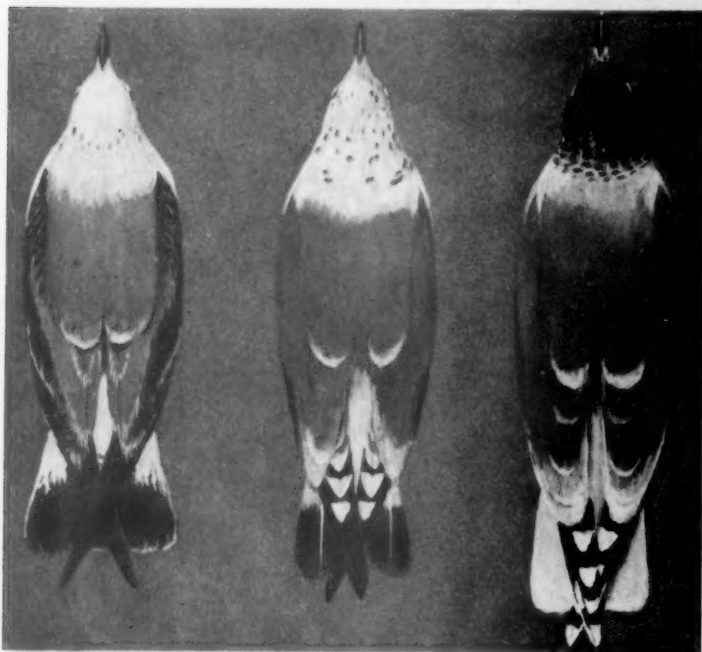
The tameness of the gulls of the Pacific coast has to be seen to be realized; on piers, coasting steamers and at fish-packing establishments the birds can be examined at a distance of a few feet. This familiarity permits a recognition of plumages that cannot be attained by the examination of skins in however complete a series. The normal sequence of plumages in the California Gull is as follows:



1
1 mo. Juv.

2
10 mos.

3
1 yr. 2 mos.



4
1 yr. 11 mos.

5
2 yrs. 1 mo.

6
2 yrs. 4 mos. Adult



First or juvenal. This is one of the darkest of gulls in juvenal plumage, the upper surface has a regular pattern, dark brown with edgings and notches of whitish; the lower surface clouded and banded with dusky so as to be almost uniform; the tail is blackish brown with an outer margin of whitish indentations, the rectrices marbled with pale gray on the inner webs at their bases; the bill is dark brown becoming black towards tip. Reference specimen—No. 1 on Plate 2; No. 1497 Brooks collection, ♀ juv., Okanagan, B. C., August 5, 1926.

By September there is a renewal of the dorsal feathers giving a drab gray (not blue) appearance; the bill becomes flesh with the terminal third abruptly black.

First spring. The drab gray back is replaced by blue-gray feathers only slightly duller than the mantle of the adult; the head and breast turn whiter but the primaries and rectrices are retained; the secondaries and tertials are usually very abraded, and the latter are reduced to filaments as the season progresses; the feet are turning from flesh to bluish. Reference specimen—No. 2 on plate; No. 1495 Brooks collection, ♀, Buena Vista Lake, California, April 26, 1923.

Second autumn. By early September of the second autumn the first complete molt brings dark brown remiges; the primaries may or may not have obscure white markings; the tail is blackish brown with a white base of varying width; mantle almost solidly gull gray; head and lower surface clouded with fuscous; bill and feet are turning green. Reference specimen—No. 3 on plate; No. 1494 Brooks collection, ♂, Comox, B. C., September 2, 1928.

Second spring. The following spring sees this plumage retained in a worn condition; the only change is that the head is entirely or mostly white. Reference specimen—No. 4 on plate; No. 3026 Brooks collection, ♀, Okanagan, B. C., June 6, 1932.

Second complete molt. This occurs in July and August when the bird is a little over two years old; the first adult plumage is now assumed. I have three specimens which plainly illustrate this change, one of which is figure No. 5 on the plate. The worn (old) primaries are quite without markings, the new, inner ones coming in have the full white apical spots and mirrors on the inner webs as in the fully adult bird; tail consists of five old rectrices only, that are clearly those of the second complete plumage. Reference specimen—No. 5 on plate; No. 1492 Brooks collection, ♀ Comox, B. C., August 26, 1927.

First adult plumage. In September the first adult plumage is complete in normal birds, the head heavily clouded, the primaries with their complete pattern, and the tail all white. Iris dark brown;

eyelid dull dark red; bill grayish yellow, aureoline on tip of upper mandible, blotch orange vermilion, bar blackish; gape and tongue deep orange, mouth paler; feet greenish yellow. Reference specimen—No. 6 on plate; No. 8082 Brooks collection, ♂, Okanagan, November 5, 1935.

Older adults have the head less heavily marked in the fall. The first nuptial plumage (not of Dwight's nomenclature) is acquired by a head molt when the head becomes pure white in February. The colors of the soft parts are the same as in the fall except that they become intensified, the bill being intense deep orange ochre, deeper even than a Herring Gull's in spring.

Dwight, to give the California Gull a three-year cycle to adult, has interposed another plumage between Nos. 5 and 6. This he designates as the third-year plumage, characterized by brown markings on the primary coverts, alula and tail and with reduced white markings on the primaries. There is no doubt that such birds occur but they are probably backward individuals and do not represent the normal sequence which is plainly illustrated by such individuals as No. 5 showing the adult pattern of primaries coming in while some of the unmarked primaries and typical second-year rectrices still persist.

The plumages of gulls cannot be reckoned by the standards of molts of other birds as there is as much more individual variation. Replacements of feathers, especially of the mantle, seem to follow no regular plan. In the larger gulls the pinkish-buff feathers of the juvenal plumage will often appear singly or in small groups in the mantle of spring birds—freshly molted feathers exactly like those of the plumage of nine months previously. The normal sequence can only be estimated by the examination of a large amount of material and there will always be a few individuals in which the age is difficult to place. In my series of *californicus* is one immature bird which is an exact parallel to the second complete plumage of *argentatus*; this is a bird in molt, the tail only half grown, taken on August 14; the whole dorsal plumage is of the 'watered' brown type so typical of second-year *argentatus*, but the tail is of the ordinary second-year type of *californicus*; there is not a single blue-gray feather in the mantle. Were it not for the pale blue feet, flesh-colored bill with abrupt black tip and the white bases to the rectrices, this bird would be regarded as a small second-year *argentatus*. I have never seen a similar bird among the hundreds of *californicus* examined. Are such birds the result of late broods or insufficient food? This is suggested by two young California Gulls collected at Morro Bay, California,

August 28, 1923. Both are exactly alike and are almost certainly of the same brood. They are quite unlike normal juvenals of this species, being much whiter, and suggest juvenal Ring-billed Gulls save that the tails are those of normal *californicus* in first plumage. The significant feature about these birds is that most of the feathers of the dorsal plumage are crossed by the transverse lines that are known as 'hunger marks' by falconers when these show in young hawks. One of these birds is figured on Plate XI of Dr. Dwight's book.

To regard the brown second-year *californicus* with 'watered' markings on the dorsal plumage, previously referred to, as a regular plumage between the juvenal and the first blue-backed plumage could be considered only if there was evidence that the blue back acquired by the juvenal in the first spring is discarded at the subsequent fall molt for the watered drab back and total absence of gull-blue plumage. There is no trace of evidence to support this. Of course, in the Herring Gulls and others of the three-year cycle this brown second-year plumage, with the dorsal plumage having a watered effect, is general and regular. It is the omission of this plumage that makes the two-year cycle in *californicus*.

No family of birds is so badly in need of correlated research in field and study as the gulls, especially in America. None of the standard text books will enable a student to identify anything but adult birds with any degree of accuracy. The key used by Ridgway in U. S. National Museum Bulletin 50 for the identification of young birds is based upon measurements alone. Collections classified under this system will present extraordinary associations. In one of the largest and most carefully worked museums in America there may be found, in one tray of immature *delawarensis*, two specimens of *californicus* and three of *brachyrhynchus*, all in their typical juvenal plumages and all labeled *delawarensis*.

When can we expect a text book on North American birds that will accord to the larger birds, especially the large water birds, the same consideration that is given to the smaller species. Something along the same lines as the 'Handbook of British Birds' now being published is what is urgently required.

EXPLANATION OF PLATE 2

- No. 1. Typical juvenal.—1 month old. 1497, ♀. Okanagan, B. C., Aug. 5, 1926.
No. 2. First spring.—10 months old. 1495, ♀, Buena Vista L. Calif., April 25, 1923.
No. 3. Second fall.—1 year 2 months old. 1494, ♂, Comox, B. C., Sept. 2, 1928.

No. 4. Second spring.—2 years 1 month old. 3026, ♀, Okanagan, B. C., June 6, 1932.

No. 5. Third fall.—2 years 4 months old. 1492 Comox, B. C., Aug. 26, 1927.

No. 6. Adult. 8082, ♂, Okanagan, B. C., Nov. 5, 1935.

(Age is computed on the basis of all birds being born about July 1.)

Okanagan Landing

British Columbia

SEX RATIOS OF DUCKS IN MINNESOTA, 1938-1940¹

BY ARNOLD B. ERICKSON

INTRODUCTION

IN the United States it was not until about 1918, that field naturalists and bird banders began to realize that the sex ratios of certain species of ducks, especially diving ducks (*Nyrocinæ*) were very disproportionate, the males outnumbering the females, at certain times, by eight or ten to one. In the British Islands, however, a number of ornithologists, as early as 1882, recognized the fact that very unequal sex ratios prevailed among certain species of ducks at certain times of the year and in certain localities. Payne-Gallwey (1882) comments on the large excess of male Common Pochards (*Nyroca ferina*) and female Greater Scaup Ducks (*Nyroca marila*). Boase (1926) published a paper on sex ratios of fourteen species of ducks based on observations made on the Tay Estuary between 1910-25. He found that in the Common Pochard and the Tufted Duck (*Nyroca fuligula*) the excess ran to males, but that in the Scaup Duck there was more often a preponderance of females and young. Robinson (1913) found in the Scaup Duck in the Orkney Islands a ratio of five males to one female, in the Pochard fifty to one, and in the Velvet Scoter (*Melanitta fusca*) twenty or thirty to one. Females, he found, were more numerous than males in the Eider (*Somateria mollissima*), Red-breasted Merganser (*Mergus serrator*), Goosander (*Mergus merganser*), and Tufted Duck. Millais (1913) also comments on sex ratios of diving ducks.

In 1925, Phillips called attention to some of the published information on sex ratios and made original observations on the ratios of the Greater Scaup and the Buffle-head (*Charitonetta albeola*). In 1932, Lincoln published the first account of sex ratios of banded ducks in the United States in which he showed that the males did outnum-

¹ Paper No. 1875, Scientific Journal Series Article, Minnesota Agricultural Experiment Station, St. Paul.

ber the females to a marked degree. McIlhenny (1937, 1940a, 1940b) has published sex-ratio data on twenty-one species of banded ducks. He found that in most species the males outnumbered the females about two to one, and that the sex ratios were more unbalanced in certain months than in others.

Sex-ratio counts of ducks have been made in the field by several observers, notably Bennett (1938) on the Blue-winged Teal and Hawkins (1939, 1940) on the Mallard. The counting of hunters' bags in order to ascertain the sex and age ratios of ducks has been tried by Hochbaum (1939). Furnis (1938) is one of the few observers who has published sex-ratio counts of ducks made on the nesting grounds. In Europe, Frieling (1934) brought together the sex-ratio data on 21,764 ducks of ten species. His figures, while showing a preponderance of males, indicate, according to Mayr (1939) more even ratios than those obtained by Lincoln and McIlhenny from banded birds.

METHOD OF MAKING COUNTS

In the winter of 1937, I started to lay plans for making a three-year field study of the sex ratios of ducks. The study was to cover only the spring migration periods when ducks are seen in the greatest numbers and the sexes are most readily differentiated. I planned to make counts over the entire migration period, which in Minnesota extends from about March 20 to May 15, and to visit as many types of habitats and localities as possible, both in eastern and western Minnesota.

My object in making these counts was to determine, if possible, whether the sex ratios obtained by such counts would show the same trends as those obtained by Lincoln and McIlhenny on banded birds, and to make observations on the factors, influences, and activities that might affect the sex ratios and abundances. The sex-ratio counts were made by counting the individuals of a flock or part of a flock, and then counting the same flock or partial flock over again, first for males and then for females. When large rafts of Lesser Scaup or other species were observed, many counts were made of more or less isolated segments of the raft. Neither sex seemed to concentrate at the peripheries of these rafts. Much of the time it was possible to count a single species without the interference of another, but occasionally two or more species were mingled, thus making the counting slightly more difficult.

In 1938, observation was begun on March 27 and terminated on May 15, during which time seventeen areas in eastern and western

Minnesota were visited, some of them several times. A total of sixty-eight hours and fifteen minutes were spent in observation. The next year, observation was begun on March 26 and terminated on May 15, during which period twenty-five areas in both parts of the state were visited. A total of sixty-two hours and forty-five minutes were spent in the field. In 1940, observation was begun on March 30 and ended on May 12. Nineteen areas were visited, and fifty-four hours and thirty minutes were spent in the field. During the three years of observation one hundred and eighty-five hours were devoted to sex-ratio counts, divided as follows among the several weeks: March week 4, twenty hours; April week 1, thirty-nine hours and thirty minutes; April week 2, twenty-nine hours and forty-five minutes; April week 3, twenty-six hours; April week 4, thirty-seven hours; May week 1, nineteen hours; and May week 2, thirteen hours and forty-five minutes.

WEATHER AND MIGRATION

Climatic influences must be taken into account in a consideration of waterfowl migration and sex ratios. The average temperature for March, 1938, in Minnesota was 38° F., which is much higher than the average for the last ten years (29.2° F.). Although the season did seem to be very early, there was no great influx of ducks in March, and the species were poorly represented. During the first two weeks in April in southern Minnesota the weather was inclement, with high winds and occasional snow flurries. Near the end of the month and during the first three weeks of May, rain fell for many days, so that rivers went out of their banks, lake levels came up, and many temporary ponds were formed. This abundance of water attracted many ducks.

The average temperature for March, 1939, was normal, 29.4° F. In March, 1938, when the temperature was far above normal, the ducks came no earlier and were, with the exception of the Lesser Scaup, no more numerous than in 1939. In fact, most species were better represented in 1939 than in 1938.

In March, 1940, the temperature averaged 24.2° F., which is five degrees less than the ten-year average. The week of March 17 and the first few days of the next week were unusually cold, and on several mornings the thermometer stood at -5° F. Rivers and streams, normally open because of current, froze over, and the migration was delayed more than a week. On March 30, the first migrating ducks were seen on the Mississippi River at Minneapolis. As late as April 18, however, lakes and ponds in eastern Minnesota were still

frozen over, and the lack of open water all but restricted the migration to river channels.

The chief effect that temperature might exert on the sex ratio would be to produce a clumping of one sex at a given period, and the leveling of the sexes at another. In the spring of 1938, for example, which was warm and early, the sex ratio of 1372 ducks observed from March 27 to April 17 was 2.53 males to one female (Table 1). During the

TABLE 1

SEX RATIOS OF DUCKS BY YEARS, 1938-40 AND THREE-YEAR TOTALS
Ratios are given for the early and late migration periods and for the total period

<i>Date</i>	<i>Total</i>	<i>Males</i>	<i>Females</i>	<i>Ratio</i>
3/27-4/17	1372	983	389	2.53-1
4/18-5/15	1005	655	350	1.87-1
3/27-5/15	2377	1638	739	2.21-1
3/26-4/17	734	442	292	1.51-1
4/18-5/15	457	245	212	1.15-1
3/26-5/15	1191	687	504	1.36-1
3/30-4/17	1495	992	503	1.97-1
4/18-5/12	945	581	364	1.59-1
3/30-5/12	2440	1573	867	1.81-1
3/26-4/17	3601	2417	1184	2.04-1
4/18-5/15	2407	1481	926	1.59-1
3/26-5/15	6008	3898	2110	1.84-1

same period of 1940, when the spring was very late, the sex ratio of 1495 ducks was 1.97 males to one female. It is known, of course, that the males of most species precede the females or are more abundant during the early spring migration. The figures quoted above, then, may indicate that temperature plays a part in determining the proportion of the sexes in a given locality at a given time. A more complete discussion of this subject is given in the paragraphs below.

SEX RATIOS IN TIME AND PLACE

When sex-ratio counts are to extend over several months, it is necessary to divide the time into an early and a late spring period, which is in reality a division based on temperature. If the area on which the counts are to be made is very large or diversified, it may also be desirable to divide it longitudinally, because sex ratios and

species ratios vary in place as well as in time. The data relating to fifteen species of ducks, presented in the text and tables of this paper are divided, therefore, into an early spring period, March 27 to April 17, and a late spring period, April 18 to May 15. They indicate that there are significant differences for the two periods in the species present, their numbers, and their sex ratios.

Before considering the sex ratio of each species separately, the sex-ratio data for all ducks observed during each of the three years will be presented as units, and finally these units given as a whole. In 1938, sex-ratio counts were obtained on 2377 ducks of sixteen species (Table 1). Of this number, 1638 were males and 739 were females, making 2.21 males for one female. The sex ratio of 1372 ducks observed in the early spring migration period, March 27 to April 17, was 2.53 : 1; 983 males and 389 females were counted during this period. In the late migration period, April 18 to May 15, when the ratio tended to become more balanced, 1005 ducks, 655 males and 350 females were counted, a ratio of 1.87 : 1. In addition, according to estimate, over 10,000 ducks were observed but not determined to sex.

In 1939, counts were made on sixteen species totaling 1191 individuals, of which 687 were males and 504 were females or 1.36 males to one female. The ratio was much more, even in 1939, because of the great scarcity of the Lesser Scaup, which in the 1938 counts formed three-fourths of the ducks, and which had the unequal ratio of 2.90 males to one female. The ratio of 734 ducks counted in the early spring period of 1939 was 1.51 males to one female. This dropped to 1.15 : 1 in the late spring period when 457 individuals were counted. About 3650 ducks were observed but not determined as to sex.

In 1940, counts were made on 2440 individuals of seventeen species. Of this number 1573 were males and 867 were females, or 1.80 males to one female. The ratio in the early spring period when 1495 ducks were counted was 1.97 males to one female. In the late spring period the ratio dropped to 1.59 : 1, with a total of 945 ducks observed. About 6000 ducks were seen but not counted sexually.

A total of 6008 ducks, 3898 males and 2110 females or 1.84 males to one female were counted during the three-year period 1938-40. The total for the early spring periods of the three years was 2417 males and 1184 females or 2.04 : 1, and for the late spring period 1481 males to 926 females or 1.59 : 1 (Table 1). These results, together with the data of other field observers, may indicate that the disparity of the sex ratios obtained by trapping have been overemphasized.

RATIOS OF DIVING DUCKS AND PUDDLE DUCKS

It has been shown by several observers that the ratio of males to females is, as a rule, more unbalanced in diving ducks than in puddle ducks. In general my findings bear this out. During the three-year period, 4563 diving ducks of nine species were counted. Of this number 3094 were males and 1469 were females or 2.10 males to one female. Six species of puddle ducks, totaling 1425 individuals, 792 males and 633 females, or 1.25 : 1 were observed during the same period (Table 2).

TABLE 2

SEX RATIOS OF NINE SPECIES OF DIVING DUCKS* AND SIX SPECIES OF PUDDLE DUCKS

Year	Total	Males	Females	Ratio
1938	*1837	1327	510	2.60-1
	530	305	225	1.35-1
1939	* 787	467	320	1.45-1
	402	219	183	1.19-1
1940	*1939	1300	639	2.03-1
	493	268	225	1.19-1
Total	*4563	3094	1469	2.10-1
	1425	792	633	1.25-1

SEX RATIOS OF DUCKS BY WEEKS

Not only do the sex ratios and numbers of ducks differ in the early and late spring migration periods, but they also vary from week to week throughout the two periods. In Table 3 are shown, by weeks,

TABLE 3

SEX RATIOS OF FOUR SPECIES OF DUCKS BY WEEKS; THREE-YEAR TOTALS

Date	Lesser Scaup			Ring-neck			Blue-winged Teal			Shoveller		
	♂♂	♀♀	ratio	♂♂	♀♀	ratio	♂♂	♀♀	ratio	♂♂	♀♀	ratio
1938-40												
Mar. Week 4	84	35	2.40-1	21	14	1.50-1	0	0		0	0	
Apr. Week 1	308	131	2.35-1	24	17	1.41-1	3	0	3.00-1	37	32	1.15-1
Apr. Week 2	990	297	3.33-1	40	35	1.14-1	35	10	3.50-1	38	33	1.15-1
Apr. Week 3	225	88	2.55-1	141	98	1.43-1	42	23	1.82-1	25	22	1.13-1
Apr. Week 4	628	315	1.99-1	94	64	1.46-1	123	90	1.36-1	23	13	1.77-1
May Week 1	4	3	1.33-1	11	8	1.37-1	34	31	1.09-1	14	6	2.33-1
May Week 2	2	4	0.50-1	7	6	1.16-1	30	26	1.15-1	6	4	1.50-1

the sex ratios of the Lesser Scaup, Ring-necked Duck, Blue-winged Teal, and Shoveller for a seven-week period. The figures represent totals for the three years of observation. Although the number of hours spent in the field were not equal for each week (page 22) they approximated one another during the heaviest migration period—the month of April.

The sex ratio of the Lesser Scaup was most unequal in the second week of April in each of the three years. All in all, 990 males and 297 females, or 3.33 males to one female, were counted in this week. As shown in Table 3, the ratio was more equal before this period and was most uniform during the fourth week of April, when for the three-year period 628 males and 315 females or 1.99 males for one female were tallied.

The sex ratio of the Ring-necked Duck showed no marked variation from week to week. The greatest disproportion of the sexes, however, came in the third and fourth weeks of April, when for the three-year period the ratios were 1.43 males to one female and 1.46 males to one female respectively. The bulk of the migrants were observed during these weeks.

In Table 3 it is clearly shown that the Blue-winged Teal is a late migrant and that the males move northward before the females. The sex ratio during the second week of April was 3.50 males to one female. In the fourth week of April when, for the three-year period, 123 males and 90 females were counted, the ratio was 1.36 : 1. By the first week in May it had fallen to 1.09 : 1.

The sex ratio of the Shoveller was almost one to one during the first three weeks of April, but in the fourth week of April and the first week of May, males definitely predominated. The ratio for this latter period, when 37 males and 19 females were counted, was 1.94 males for one female. Admitting that the numbers of counts of Shovellers are few, it still is difficult to account for this increase of males in late April and early May. It is possible that in early springs the females might be nesting and would thus be seen less frequently than the males.

Much of the remainder of the paper is devoted to a discussion of the sex ratios and numbers of the individual species. In order to avoid repetition, ratios and numbers for the early and late migration periods and for the various years are not always given completely in the discussion. In Table 4 the data are presented in complete form.

LESSER SCAUP (*Nyroca affinis*).—The Lesser Scaup was the most abundant species observed during this study, and it exhibited the

TABLE 4
SEX RATIOS OF FIFTEEN SPECIES OF DUCKS IN THE EARLY AND LATE SPRING MIGRATION PERIODS

Species	1938			1939			1940			1938-1940		
	3/27-4/17	4/18-5/15	Total	3/26-4/17	4/18-5/15	Total	3/30-4/17	4/18-5/12	Total	3/26-4/17	4/18-5/15	Total
	♂ : ♀	♂ : ♀		♂ : ♀	♂ : ♀		♂ : ♀	♂ : ♀		♂ : ♀	♂ : ♀	
Lesser Scaup	916	618	2.20-1	135	93	1.90-1	902	450	1.86-1	1953	1161	2.04-1
Ring-neck	21	44	1.44-1	198	47	1.24-1	62	208	1.47-1	281	299	1.43-1
Blue-winged Teal	31	183	1.50-1	14	89	1.17-1	13	117	1.25-1	58	389	1.34-1
Shoveller	56	39	1.80-1	93	21	1.33-1	19	25	1.77-1	168	85	1.65-1
Pintail	36	44	1.60-1	53	9	1.25-1	178	2	1.00-1	267	55	1.50-1
Mallard	100	10	1.00-1	42	12	1.00-1	62	30	1.00-1	204	52	1.00-1
Baldpate	8	16	1.28-1	43	14	1.00-1	37	8	1.00-1	88	38	1.11-1
Redhead	101	13	1.17-1	9	8	1.00-1	31	48	2.00-1	141	69	1.65-1
Canvas-back	75	3	2.00-1	25	6	3.00-1	4	34	1.00-1	104	43	1.26-1
Am. Merganser	7	1	1.00-0	59	39	0.30-1	39	0	1.00-1	105	42	0.35-1
Red-breasted Merganser	0	9	0.80-1	36	0	1.57-1	51	0	0.00-2	51	45	1.36-1
Am. Golden-eye	15	3	0.50-1	45	2	2.00-1	73	2	0.00-1	133	7	0.75-1
Gadwall	3	4	1.00-1	8	4	1.00-1	0	2	1.00-1	11	10	1.00-1
Buffle-head	1	10	1.50-1	6	7	0.75-1	7	18	2.00-1	14	35	1.50-1
Ruddy Duck	0	0		2	70	0.89-1	8	0	1.66-1	10	70	0.89-1

most unbalanced sex ratio. In 1938, 1534 Scaups, 1142 males and 392 females, or 2.91 males to one female, were counted (Table 4). The ratio in the early spring period was 3.58 males to one female; in the late spring period it had fallen to 2.20 males to one female.

The most noteworthy feature of the 1939 migration was the comparative scarcity of the Lesser Scaup and the comparative abundance of the Ring-necked Duck. Where there had been thousands of Lesser Scaups on the Mississippi River and the lakes and sloughs in all parts of the state in 1938, there were tens the following spring. Only 228 Lesser Scaups, 161 males and 67 females, or 2.40 males to one female, were tabulated. The ratio in the early spring period of 1939 was 2.85 males to one female and in the late spring period was 1.90 males to one female.

It is interesting to speculate, but not easy to determine, why Lesser Scaups were abundant in 1938, very scarce in 1939, and abundant again in 1940. The variation in numbers may have been due to one or to many factors. The following seem to be most cogent: the 1938 breeding season was unsuccessful; hunting and other decimating factors took a heavier toll in the fall and winter of 1938-39 than during the same period of 1937-38; the migration was late and the majority of Scaups passed through western Minnesota; water and food conditions were more favorable in western Minnesota and the Dakotas and most of the Scaups passed northward through this region. Of the four suppositions, the last seems most tenable.

The 1940 migration of Lesser Scaups appeared to be equal to or greater than the 1938 migration. The ratio of 1352 individuals, 938 males and 414 females, was 2.26 : 1. The ratio of 902 birds counted in the early spring period was 2.51 males to one female, and for 450 observed in the late spring period, 1.86 males to one female.

A total of 3114 Lesser Scaups were counted during the three year period. Of this number 2241 were males and 873 were females or 2.56 : 1. The ratio of 1953 individuals counted in the early spring period was 2.96 males to one female, and for 1161 tabulated in the late spring period, 2.04 : 1.

RING-NECKED DUCK (*Nyroca collaris*).—The sex ratio of the Ring-necked Duck in Minnesota during the time covered by this study was more uniform than that of the Lesser Scaup. Also, there was no pronounced difference in the ratios of the early and late spring migration periods. It is sufficient to note here the three-year totals. In all, 580 Ring-necks, 338 males and 242 females were counted, or 1.39 males to one female.

In 1938, only 65 Ring-necks were counted. In 1939, when 245 were counted, it was in a lesser degree what the Lesser Scaup had been to the 1938 migration—the most abundant and conspicuous species. It appeared to be even more abundant in 1940, when 270 were counted.

BLUE-WINGED TEAL (*Querquedula discors*).—There is a marked tendency for the males of this species to precede the females in migration, despite the fact that Blue-winged Teals do not start to arrive in Minnesota in numbers until the second week in April. The ratio for the early spring period, three-year totals, was 3.14 males to one female, and for the late spring period 1.34 : 1. The ratio for both periods, based on 447 individuals, was 1.48 : 1.

SHOVELLER (*Spatula clypeata*).—Shovellers arrive in Minnesota as mated pairs, even at the beginning of the early spring period. The ratio for 168 individuals, three-year totals, was 1.15 males to one female. In the late spring period, three-year totals, the number of males to females was more disproportionate than in the early spring period. Of the 85 individuals observed after April 18, 53 were males and 32 females, or 1.65 : 1. It is possible that a surplus of young, unmated males occurs in the late spring migration, thus causing the disproportion.

PINTAIL (*Dafila acuta tzitzihua*).—The Pintail is one of the most abundant ducks in Minnesota during the spring migration, particularly in the western part of the state. Its ratio seems to be very equal. In all, 322 Pintails, 173 males and 149 females were counted, or 1.16 males to one female. In 1938 and 1939 at Lake Traverse, Minnesota, many hundreds of paired Pintails were observed standing on the ice.

MALLARD (*Anas platyrhynchos platyrhynchos*).—The Mallard, like the Pintail, has a very even sex ratio; and like the Pintail, too, many hundred mated pairs were seen at Lake Traverse in 1938 and 1939. Of 256 individuals counted in various parts of the state, 129 were males and 127 were females, or 1.01 males to one female.

BALDPATE (*Mareca americana*).—Ducks of this species were not abundant in any of the three spring migration periods. Twenty-four were counted in 1938, 57 in 1939, and 45 in 1940. The sex ratio of 126 Baldpates, 69 males and 57 females, was 1.21 to one.

REDHEAD (*Nyroca americana*).—The Redhead, never abundant in Minnesota in the last decade, fluctuated in numbers during the three seasons of observation. In 1938, it was fairly common in the western part of the state, and 114 were determined to sex. The next year it seemed to have suffered a setback, and only 17 were counted. In

1940, it was more common, particularly in eastern Minnesota, where 79 were counted and about 200 others were observed. The ratio of 210 individuals, 128 males and 82 females, was 1.56 : 1.

CANVAS-BACK (*Nyroca valisineria*).—This species, like the Redhead, was observed most commonly in 1938. It decreased in numbers in 1939, and became more abundant again in 1940. The ratio of 147 individuals, 94 males and 53 females, was 1.77 : 1. About 200 other Canvas-backs were observed in eastern Minnesota but were not determined sexually.

AMERICAN MERGANSER (*Mergus merganser americanus*).—The American Merganser was, with the exception of the Ruddy Duck, the only species studied in which the females outnumbered the males. In the early spring period before April 17, the ratio was 1.23 males to one female. In the late spring period it was 0.35 males to one female. The ratio for 147 individuals observed during both periods was 0.88 males to one female. These ratios may indicate that the females remain longer than the males in southern localities, once the northward migration has started, and that the females may slightly outnumber the males. It is probable, too, that first spring males are not always distinguishable from females in the field.

AMERICAN GOLDEN-EYE (*Glaucionetta clangula americana*).—A large proportion, 133 out of 140, of the Golden-eyes counted during this investigation were observed in the early spring period. The ratio of these 133 individuals, 79 males and 54 females, was 1.46 to one. For the entire 140, the ratio was 1.41 to one.

RED-BREADED MERGANSER (*Mergus serrator*).—This merganser does not remain in Minnesota during the winter in large flocks as does the American Merganser. As a rule, it is not a particularly common migrant. In the period covered by this study it was least common in 1938, when only 9 were seen, and most common in 1940, when 51 individuals were counted. The ratio of 51 individuals observed in the early spring period was 5.37 males to one female, and of 45 observed in the later period, 1.36 males to one female. For both periods the ratio was 2.55 males to one female.

RUDDY DUCK (*Erismatura jamaicensis rubida*).—No Ruddy Ducks were counted in 1938; 72 were counted in 1939; and 8 were counted in 1940. Ruddies are difficult to count and determine as to sex during migration because they remain well offshore, ride low in the water, and dive constantly. In good light, however, the white patches on the face of the male and the blue bill help in the separation of the sexes. Of the 80 Ruddy Ducks counted during the three years, 39 were males and 41 females, or 0.95 male to one female.

GADWALL (*Chaulelasmus streperus*).—Fewer Gadwalls were observed than any other species of puddle duck. Only 21 individuals were counted, 11 males and 10 females.

BUFFLE-HEAD (*Charitonetta albeola*).—Although only 49 Buffle-heads were observed during three springs of sex-ratio counting, the species appears to be increasing. In 1938, eleven were counted; in 1939, thirteen; and in 1940, twenty-five. Thirteen out of the fourteen Buffle-heads seen in the early spring period were males. In the late spring period, twenty-one out of thirty-five were males, or 1.50 males to one female. The ratio of 49 individuals, 34 males and 15 females, was 2.26 : 1.

POSSIBLE FACTORS CAUSING DISPARITY OF SEXES

Various ideas have been advanced to explain the unbalanced sex ratios of ducks. The reactions of ducks to biotic factors are usually the bases for these ideas. Differences in vulnerability to predators, hunting, diseases, accidents, and alterations in the environment are probably among the most important of these factors.

There seems to be no doubt that the female, which does all of the incubating and in most cases cares for the young without the assistance of the male, is more subject to predation than the male. The degree and kind of predation at the time of postnuptial molt may well vary according to the sex and species. Hochbaum (1939), for example, believes that during the flightless period, male diving ducks repair to open lakes while females remain in the marshes. Both sexes of puddle ducks remain in the marshes during the flightless period.

Types of hunting and selective shooting probably play a part in influencing the sex ratio. Hochbaum (1940) has shown that in 'jump-shooting' in northern waters the female Mallard is much more frequently killed by hunters than the male. McIlhenny (1940a), on the other hand, believes that the male is more frequently killed by hunters than the female. On the whole, however, it would seem that the large majority of hunters kill what they can and do not practice selective shooting.

Among the diseases affecting ducks may be listed lead poisoning, botulism, *Leucocytozoon* infections, and worm-parasite infections. Wetmore (1919) has intimated that lead poisoning may affect the male more than the female. Lead probably decreases the fertility of both sexes, but whether it adversely affects the female egg more than the male egg is not known. In fact, far too little is known

about the effect of diseases on sex and age classes of ducks to draw any definite conclusions. It seems reasonable, however, to assume that the female might be more subject to invasions of diseases than the male, especially after the egg-laying period and at the close of the long incubation period, during which time she has used up stored minerals in producing the eggs and probably has not been getting the proper amount and kind of food because of incubating duties.

In general, the female that nests in a greatly disturbed environment is more subject to predation and the activities of man than the one that nests in an undisturbed habitat.

Certain other biotic factors such as genetic factors (sex-linked lethals) and physiological factors (differences in rate or level of metabolism), are sometimes mentioned in relation to unequal sex ratios of ducks. They probably have little bearing on the phenomenon.

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SUMMARY

Sex-ratio counts were made on fifteen species of ducks during the spring migration periods of 1938, 1939, and 1940. The results obtained from the counts were, for each year, considered under an early spring period, March 27 to April 17, and a late spring period, April 18 to May 15. Significant differences were found in the species present, their numbers, and their sex ratios for the two spring periods.

In 1938, 2377 ducks were counted as to sex. The ratio of males to females was 2.21 : 1. The ratio of 1191 ducks counted in 1939 was 1.36 males to one female, and in 1940, when 2440 individuals were counted the ratio was 1.80 males to one female. In the three years of observation, 6008 ducks, 3898 males and 2110 females, or 1.84 males to one female, were counted. Of these 6008 ducks, 4563 were diving ducks (Nyrocinæ), 3094 males and 1469 females or 2.10 : 1;

and 1425 were puddle ducks (Anatinae), 792 males and 633 females or 1.25 : 1. These results, together with the data of other field observers, may indicate that the disparity of the sex ratios obtained by trapping have been overemphasized.

The sex ratios and abundances of four species of ducks, Lesser Scaup, Ring-necked Duck, Blue-winged Teal, and Shoveller, were studied by weeks for each of the three years. It was found that both sex ratios and abundances varied from week to week.

For each of the fifteen species of ducks counted, the sex ratios and abundances are given in the text and summarized in the tables of the paper. The various ideas that have been advanced to explain the disparity of the sexes are discussed.

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CERTAIN RELATIONS BETWEEN THE PARTS OF BIRDS' EGGS

BY V. S. ASMUNDSON, G. A. BAKER AND J. T. EMLÉN

INTRODUCTION

THICKNESS of shell has been shown by Asmundson and Baker (1940) to have a marked effect on the percentage of shell of avian eggs. They have further shown that changes in shape within ordinary limits have little effect on the percentages of shell, whereas given a constant thickness of shell, the percentage of shell increases markedly with a decrease in volume (size). Actually, however, the eggs of many species which lay small eggs have relatively less shell than the larger eggs of other species (Grossfeld, 1938). The reason for the relatively low percentage of shell on small eggs is not evident from published data since little information is available on the weight of the various parts of the eggs laid by different species of birds and even less on the thickness of shell. Eggs of different species were, therefore, obtained to secure more nearly complete data. While the number of species represented is small and the number of eggs from each species is comparatively small, the data are presented here with the hope that others will take the trouble to collect similar information when a favorable opportunity presents itself.

MATERIAL AND METHODS

Eggs were obtained from nests wherever possible while the nests were being added to. The eggs were removed as soon as possible

to a room maintained at 55° F. Nevertheless they varied in age from a few hours to several days when they were measured, weighed and partitioned. Only the Cliff Swallow's eggs had, however, been incubated.

All eggs were measured to the nearest hundredth of a millimeter and weighed to the nearest hundredth of a gram. Density was determined as previously described (Asmundson and Baker, 1940).

An unknown variable was the age of the birds that laid the eggs. Data for the Domestic Fowl (Curtis, 1914; Jull, 1924, and others) show that the amount of yolk as a percentage of total egg weight increases during the first three or four months after egg production starts at about six months of age. Thus, Jull's data show a maximum average difference of about 3 per cent. The eggs from various individuals have yolks that differ on the average by as much as 10 per cent (Curtis, 1914). Age is presumably a minor factor when eggs from wild species are compared since eggs are not usually laid until the birds are about a year old, but individual differences may well be important. Other factors admittedly may also have a considerable influence on the values obtained from small numbers of eggs.

EGG DATA

The data obtained are summarized in Tables 1 and 2. Data for the first four species have been published in part elsewhere (Asmundson and Baker, 1940).

Relation of yolk and albumen.—The yolk is generally regarded as the mechanical stimulus to secretion of albumen, its volume as well as the size of the oviduct determining the amount of albumen secreted. It seemed desirable therefore to attempt to measure the direct relation between the weight of the yolk and the white. For this purpose the data summarized by Grossfeld (1938, p. 78) and the data in Table 1 were used to determine the relation between the weight of the yolk and the weight of the white in eggs from twenty-four species.

Text-figure 1 shows that for the species of birds studied, the relation between the weight of yolk, y , and weight of white, w , is well represented by the equation,

$$(1) \quad w = 1.56y + 0.7$$

A line was drawn through the data and the constants 1.56 and 0.7 were read off from the graph.

It is a mistake in principle to attempt to fit the curves of Text-figures 1-4 to the data by means of least-squares technique. The

TABLE 1

DATA FOR THE EGGS OF TEN SPECIES

Thickness of shell of turkey eggs and specific gravities are not in all cases based on the total number of eggs shown

	No. of Eggs	Length mm.	Diameter mm.	Index (D/L) %	Egg Weight gm.	Yolk Weight gm.	Albumen Weight gm.	Shell Membrane gm.	Shell		Specific Gravity	
									Weight gm.	Thickness mm.	Egg	Shell
Turkey ¹	196	65.65	47.47	72.3	81.76	25.99	47.21	1.32	7.25	.35	1.075	2.174
Chicken ²	64*	57.29	41.64	72.7	55.81	17.21	32.97	0.35	5.28	—†	1.082	2.235
Silver Pheasant ³	7	52.19	39.18	75.1	44.09	17.44	21.47	0.30	4.88	.36	1.083	2.288
Ring-necked Pheasant ⁴	23	42.77	33.65	78.7	26.66	8.71	15.15	0.22	2.58	.26	1.085	2.325
Quail ⁵	5	35.00	24.19	69.1	10.34	3.17	6.18	0.27	0.72	.21	1.043	1.843
Brewer's Blackbird ⁶	4	24.96	18.40	73.7	4.58	0.91	3.33	0.03	0.31	.15	1.057	2.059†
Mockingbird ⁷	4	22.93	18.12	79.0	4.10	0.73	3.05	0.03	0.29	.17	1.032	1.586
Tricolored Red-wing ⁸	17	24.58	16.93	68.9	3.67	0.75	2.64	0.03	0.25	.13	1.039	1.511
Cliff Swallow ⁹	4	21.06	14.31	67.9	2.16	—	—	0.02	0.15	.11	—	—
Barn Swallow ¹⁰	5	18.79	13.68	72.8	1.90	0.52	1.23	—	0.15	.15	1.031	1.4806

* Average for eggs from each of 64 hens or 384 eggs.

† The value used in Text-figure 3 is 0.31 (see Asmundson and Baker, '40).

‡ Extremely variable.

¹ Meleagris gallopavo² Gallus domesticus³ Gennaeus nycthemerus⁴ Phasianus colchicus torquatus⁵ Lophortyx californica⁶ Euphagus cyanocephalus⁷ Mimus polyglottos⁸ Agelaius tricolor⁹ Petrochelidon albifrons¹⁰ Hirundo erythrogaster

method of least squares weights extreme deviations much more heavily than it does small deviations. Since it is desired to obtain trend lines that will hold for most species, and since it is admitted that species differences from this trend exist, it would not be proper to use the method of least squares even though the points were equally stable from a random-sampling point of view. Some of the points are based on very few eggs, and some on many eggs. If each point is given equal weight, for which there is an argument because they are for different species, then too much weight is given to the points subject to large random errors. If each point is weighted by the number of eggs on which

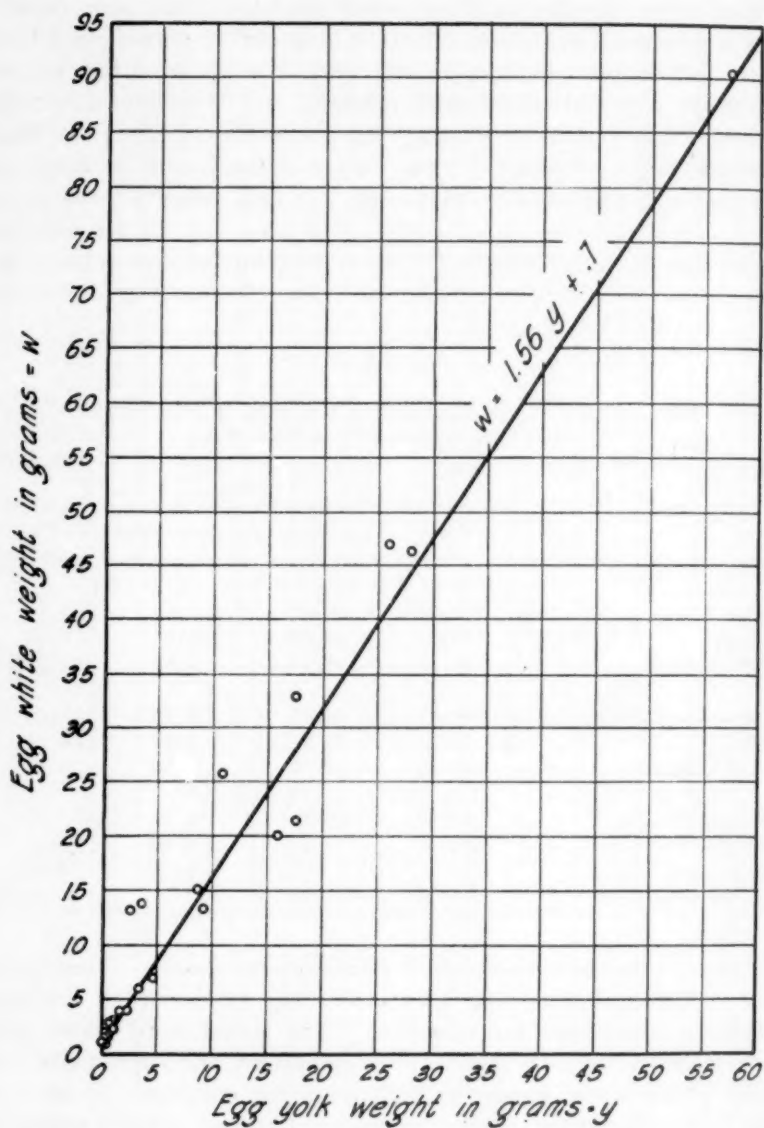
TABLE 2

RELATIVE WEIGHT OF THE PARTS OF THE EGGS OF TEN SPECIES
(SEE TABLE 1 FOR ACTUAL WEIGHTS)

Species	Percentages			
	Yolk	Albumen	Shell membrane	Shell
Turkey	31.79	57.74	1.61	8.87
Chicken	30.84	59.06	0.63	9.46
Silver Pheasant	39.56	48.70	0.68	11.07
Ring-necked Pheasant	32.67	56.83	0.83	9.68
Quail	30.66	59.77	2.61	6.96
Brewer's Blackbird	19.86	72.70	0.66	6.77
Mockingbird	17.80	74.39	0.73	7.07
Tricolored Red-wing	20.44	71.93	0.82	6.81
Cliff Swallow	—	—	0.78	6.94
Barn Swallow	27.36	64.74	—	7.89—

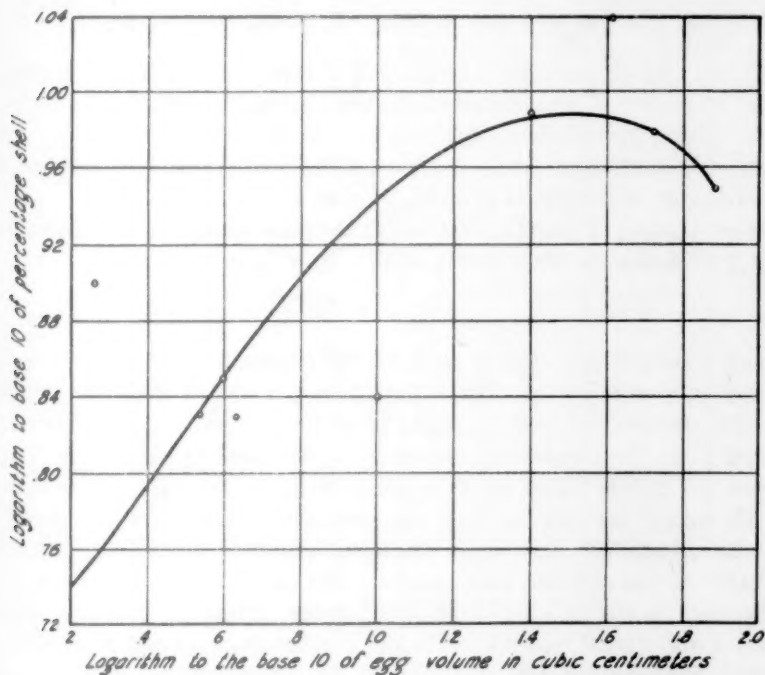
it is based, then too little weight is given to some species. Thus again, least-squares technique may give misleading results unless arbitrary weighting procedures are employed. The curves were drawn with these considerations in mind. For comparison, the least-square constants giving equal weight to each point for equation (1) are 1.55 and 2.05. The effect of using the method of least squares would be to pull the line up away from the lower cluster of points but leave the slope unchanged.

Five or six species show fairly wide discrepancies from the trend line for all species. These discrepancies may represent species differences, random errors, errors of determination or some biological differ-



TEXT-FIG. 1.—Relation of weight of white to weight of yolk for twenty-four species of birds whose average egg sizes range from 1.53 to 161.0 grams.

ences besides species differences. Among the differences which affect this relationship are differences in the age of the females laying the eggs. For instance, Silver Pheasant hens do not lay until they are about two years old; hence their eggs may not be strictly comparable to the first-year eggs of other species. On the whole there is, however, a remarkable conformity with the straight line in Text-figure 1.



TEXT-FIG. 2.—Logarithm of percentage of shell plotted against logarithm of egg volume.

Relation of the shell to egg volume.—It is evident from Table 1 that the weight of shell decreases as would be expected with a decrease in egg weight. Consider equation (7) of (Asmundson and Baker, 1940) which gives percentage shell as,

$$(2) \quad P = \frac{3^{\frac{1}{2}} \pi^{\frac{1}{2}} \left(\lambda + \frac{\sin^{-1} \sqrt{1-\lambda^2}}{\sqrt{1-\lambda^2}} \right) D_s T_s (100)}{2^{\frac{1}{2}} \lambda^{\frac{1}{2}} V^{\frac{1}{2}} D_e}$$

where P = percentage shell. λ = breadth/length, D_s = shell density, D_e = egg density, T_s = shell thickness in centimeters, V = egg vol-

ume in cubic centimeters which was computed from the weights and specific gravities in Table 1. For the present purpose and data λ is so nearly constant, slight variations make so little difference and the differences are so erratic that the part of (1) containing λ and pure numbers will be designated by K (a constant).

Take logarithms of both sides of (2) and we obtain,

$$(3) \quad \log P = \log K + \log D_s + \log T_s - \log D_e - \frac{1}{3} \log V$$

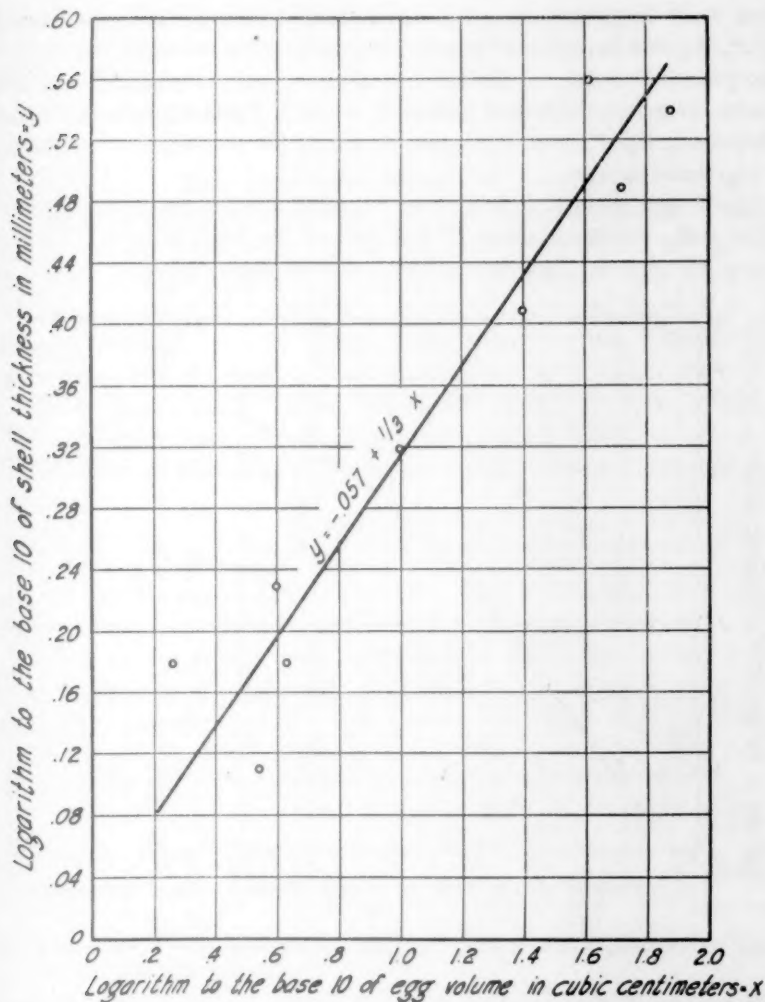
If D_s , T_s and D_e were not functions of V then $\log P$ would be a linear function of $\log V$, i.e., the plot of $(\log V, \log P)$ would be a straight line. Text-figure 2 shows that the plot of $(\log V, \log P)$ is very definitely not a straight line. It thus becomes of interest to inquire as to what sort of functions of V D_s , T_s and D_e are.

If we plot $\log T_s$ against $\log V$ (Text-figure 3) we see that a straight line represents the data fairly well. This implies that,

$$(4) \quad T_s = c V_b$$

where c and b are constants to be determined. The graph shows that b may well be $\frac{1}{3}$. For comparison it is noted that the method of least squares and equal weights gives $C = +.047$, $b = 0.27$ as compared with the considered values of $-.057$ and $\frac{1}{3}$ shown in Text-figure 3. Points based on very small numbers of eggs are given too much weight by this method (see above). The data are suggestive of the possibility that shell thickness depends principally on the volume of the egg and that species differences are small except as a reflection of the species differences in egg volume. Data for other species may reveal exceptions; hence further data should be obtained before final conclusions are drawn. However, as far as T_s is concerned, $\log P$ should still be a linear function of $\log V$ since T_s is such a function and it combines with $-\frac{1}{3} \log V$ and $\log K$ to give a linear function. If $b = \frac{1}{3}$, then shell thickness is a constant proportion of a diameter of the egg and percentage shell depends only on D_s/D_e . If percentage shell is proportional to D_s/D_e , then the curves of Text-figures 2 and 4 could be made to coincide by shifting one scale properly with respect to the other. The agreement is as good as could be expected with the data at hand.

The variation in D_e is only about 5 per cent. Instead of considering D_s and D_e separately, we may consider D_s/D_e . Text-figure 4 shows that $\log D_s/D_e$ is a non-linear function of $\log V$. $\log D_s/D_e$ increases to a maximum and then decreases. The maximum density of shell appears to be for eggs about the size of Ring-necked Pheasant



TEXT-FIG. 3.—Logarithm of shell thickness plotted against logarithm of egg volume.

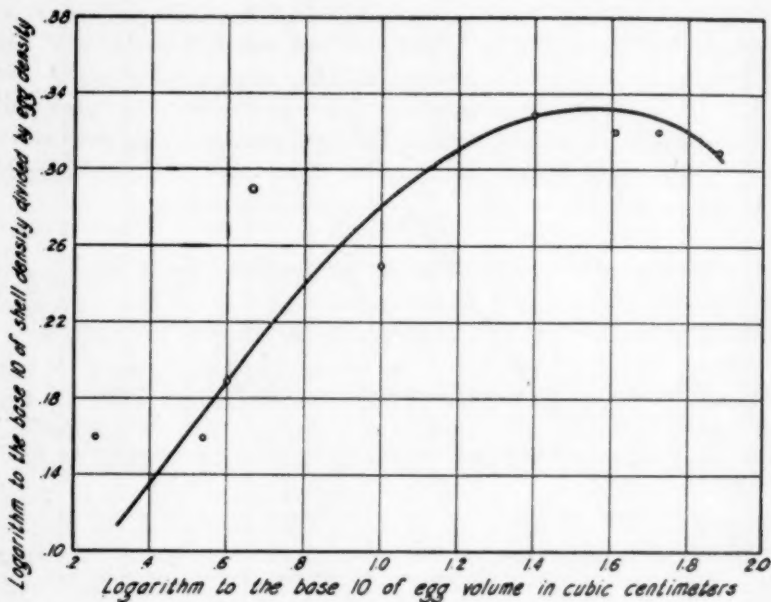
eggs. Thus it appears that D_s is largely responsible for the non-linearity of the $(\log V, \log P)$ graph.

Relation of yolk, albumen, and shell membrane to egg volume.—Since the relation,

- (5) $P + P_y + P_a + P_m = 100$, where P = percentage shell, P_y = percentage yolk, P_a = percentage albumen, P_m = percentage shell membrane,

must hold in every case, it follows that if one of the quantities P , P_y , P_a , P_m is a function of egg volume then some or all of the remaining quantities must be similar functions of egg volume. P has been shown (Text-figure 1 and Table 2) to be a function of egg volume. Therefore, P_y , P_a and P_m must be functions, constant or otherwise, of egg volume also.

Small eggs weighing less than 5 grams tended to have relatively small yolks weighing about 20 per cent of the total weight. The one exception in our data is the eggs of the Barn Swallow where the



TEXT-FIG. 4.—Logarithm of D_s/D_e plotted against logarithm of the egg volume.

yolk weighs 27.4 per cent of the egg weight. Eggs weighing 10 grams or over tend to have yolks weighing about 30 per cent of the total egg weight. Data summarized by Grossfeld (p. 78) have two exceptions to this rule out of fourteen species cited. These facts point to the conclusion that percentage yolk is a non-constant function of egg volume.

The data in Tables 1 and 2 show that the smaller eggs have a lower percentage of albumen than do the larger eggs, so that percentage albumen is also a non-constant function of egg volume.

The turkey egg is known to have a relatively heavier shell mem-

brane than the egg of the Domestic Fowl (Asmundson, 1939). Table 2 indicates that the shell membrane in quail eggs is relatively even heavier than that of turkey eggs. These data do not indicate whether the trend of percentage shell membrane is a constant or non-constant function of egg volume.

DISCUSSION

Two especially important relationships emerge from the data considered in this paper. One is the relation between the yolk and the albumen or white expressed by equation (1) above. The amount of albumen secreted around a small yolk is relatively larger than the amount secreted around a larger yolk which agrees with the data of Pearl (1910) for multi-yolked as compared with single-yolked eggs of the Domestic Fowl. This relation is best expressed by a straight line although there may be significant species differences from the straight-line relationship (Text-figure 1) which fits the data for most species.

The second general relationship is the decrease in thickness of shell with a decrease in volume which is linear when $\log T_s$ is plotted against $\log V$ (Text-figure 3). This relationship is undoubtedly necessary for the survival of the various species since it is improbable that a young bird weighing one gram, for instance, could pick its way out of a relatively thick shell such as is found on a 20- or even 10-gram egg. On the other hand, the larger eggs presumably require a thicker shell than the smaller eggs to protect them against breakage by the parent birds while they are being incubated.

Undoubtedly the eggs of many species differ significantly from one or more of the general relationships found to hold for most species. Such deviations as a result of evolutionary change should not prove detrimental provided they do not interfere seriously with the nutrition of the embryo or its ability to emerge from the shell at the end of the incubation period.

SUMMARY

1. Data are presented for the eggs of ten species of birds. Of these, four were domesticated species or birds kept in confinement. Data summarized by Grossfeld (1938) were also used to calculate the relation between the weight of the yolk and the albumen.

2. For most species the relation between the weight of the yolk and the white is represented by the line

$$w = 1.56y + 0.7$$

where w is the weight of the white and y is the weight of the yolk.

There were some deviations which presumably are due to species, individual, age or other differences.

3. Evidence is presented which indicates that densities of the egg and of the shell are functions of egg volume.

4. Shell thickness decreases with a decrease in egg volume. The plot of $\log T_s$ against $\log V$ is represented fairly well by a straight line implying that

$$T_s = c V^b$$

where c and b are constants to be determined.

5. Percentage shell, percentage yolk, percentage albumen, and percentage shell membrane are similar functions of egg volume.

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FUNCTIONAL ASPECTS OF THE INNER VANE OF REMIGES

BY FRANK RICHARDSON

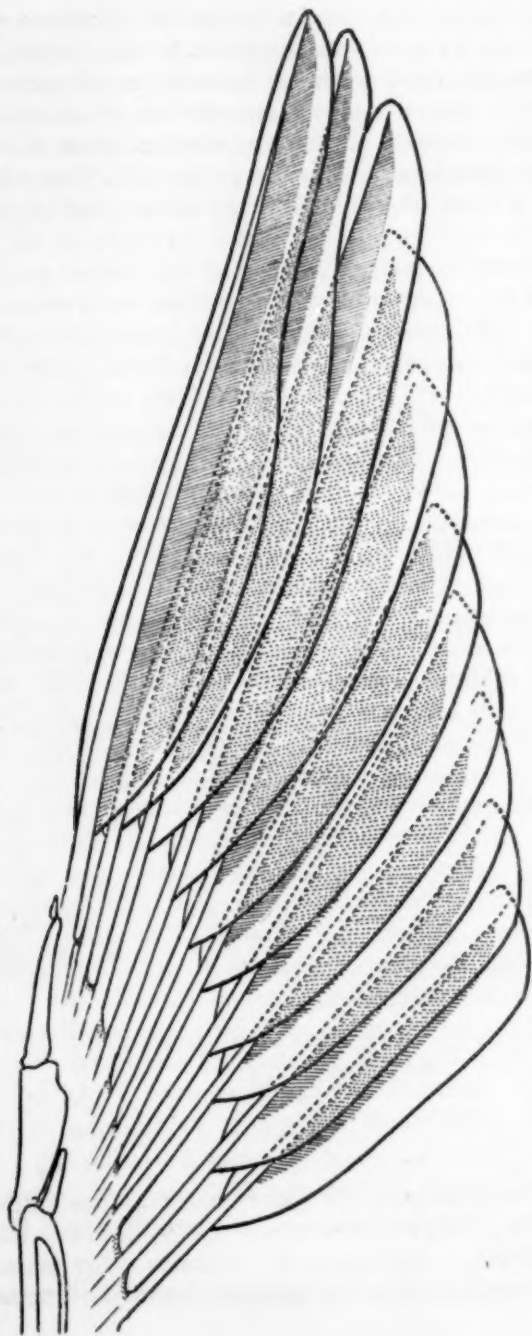
Plate 3, upper figure

THE perfection of bird flight has long been a subject of wonder, and the structure of the wings which make such flight possible has stimulated much research. Nevertheless, the detailed perfection of wing structure is not yet adequately understood. The purpose of this

paper is to discuss further a particular functional condition of the primary feathers of the wing. In certain birds, notably Anseriformes and some Galliformes, part of the inner vane of the primaries (and occasionally to some extent that of secondaries) is exceptionally stiffened. As Chandler (1916, p. 327) has written, there is a great development of the basal one-third to two-thirds of the ventral ridge of each ramus into a broad, thin, filmlike expansion. Each expansion extends over and presses against the ramus in front of it. This produces a conspicuous macroscopic effect on the ventral surface of the feather, giving that portion of the inner vane involved a shiny, glazed appearance (Plate 3, upper figure).

The condition just described has long been known. It is mentioned by Wray (1887, p. 421), but Ahlborn (1896, p. 20) appears to have been the first to publish an adequate description. Mascha (1905, pp. 1-30) further illustrates and compares the condition in various birds. Stubbs (1910, p. 329), though thinking the condition had not been described, gives clear illustrations and additional information. Chandler (1916, pp. 243-446) has further described such feather structure. All of these authors have contributed to the knowledge of the occurrence of the visibly stiffened vanes of primaries. Supplemented by my own investigations, the following birds may be listed as markedly exhibiting this condition: *Diomedea*, all Anseriformes (although nearly absent in *Erismatura*), eagles (*Aquila*), many Galliformes (*Dendragapus*, *Lagopus*, *Tympanuchus*, *Centrocercus*, *Perdix*, *Pucrasia*, *Phasianus*, *Chryslophus*, and *Meleagris*) and certain owls (*Bubo maximus* and *Nyctea*). The modification is present in the Galliformes in all the Tetraonidae examined and certain of the Phasianinae. It is lacking in all the Odontophorinae examined (*Oreortyx*, *Callipepla*, *Lophortyx*, *Colinus*, and *Odontophorus*), in most of the Phasianinae (*Alectoris*, *Francolinus*, *Pternistes*, *Coturnix*, *Rollulus*, *Bambusicola*, *Tragopan*, *Crossoptilon*, *Gennaeus*, *Lophura*, *Gallus*, *Polyplectron*, and *Argusianus*), and in *Numida* and *Opisthocomus*. In the albatrosses, eagles, and owls the modification is marked near the base of the barbs but does not extend very far along them. Intermediate conditions are found in other birds too, as in *Grus*, but the ready visibility of the greater modification is unmistakable. A curious but not strictly comparable stiffening of the inner vane of a region of the primaries of adult males of *Cnipodectes*, a Central and South American tyrannid, has been described by Zimmer (1939, pp. 110-12).

The functional significance of the described modification is con-



TEXT-FIG. 1.—Ventral view of the left wing primaries of the Black Brant (*Branta bernicla nigricans*), times six-tenths. Traced and drawn from a dried specimen. The areas of stiffened rami on the primaries are shown by striations of solid lines when the stiffened area is visible, but striations of dotted lines when the area is covered by the inner vane of the preceding feather. It can be seen how the stiffened areas extend approximately from the shaft of one primary to that of the next, thus strengthening this feather region which must stand heavy air-pressure.

sidered by Mascha (1905, p. 11). He states that "... the secondary quills [barbs] are highest and as a consequence the feather vane the strongest and most capable of resistance where the greatest force is to be withstood." Apparently no author has stated that the over-curling of the ventral ridges of barbs must effectively close the gaps between the barbs especially when air is pushing against them. Furthermore, the relations between remiges, and the correlation of the modification with habits or types of flight, seem not to have been considered. The present paper is concerned chiefly with these latter problems. The effects of domestication, especially in view of the belief that domestication reduces specialization, is also discussed.

I gratefully acknowledge the use of the specimens of the Museum of Vertebrate Zoology of the University of California, directed by Dr. Alden H. Miller, in determining the phylogenetic occurrence of the modified wing feathers.

INTERRELATION OF PRIMARIES

Although many species have been studied with regard to modified primary barbs, it is convenient to choose one species as an example. The Black Brant (*Branta bernicla nigricans*) well serves as such an example because it, like the Anseriformes as a whole, has the modification highly developed (Text-fig. 1).

The barbs of the inner vanes of all the primaries are modified although modification is most marked on the outermost primaries and becomes least marked on the innermost ones. This is what might be expected from a functional point of view because the distal primaries (having a greater lever arm) necessarily strike the air with greater speed and meet with greater resistance.

The extent of the modification in the individual primaries seems most closely correlated with the overlapping of the primaries. As Text-fig. 1 shows, the shaft of each primary fits approximately above the outer margin of modified barbs of the preceding primary. This is true when the primaries are in the typical position for powerful flight, but less true when the primaries are more closed as in gliding or more open as in alighting. With the exception of the first primary, the modified area of the barbs of each remex is covered ventrally by the unstiffened margin of the inner vane of the preceding remex. The stiffening of the inner vane of the first primary, as might be expected from the fact that this area is directly exposed to air pressure, is definitely greater than that of the vanes of other primaries. The resistance of the latter is very effective, however, because air

pressure forces the overlapping margins of inner vanes close against and medial to the over-lying stiffened area. The outer vanes become stiffer and firmer in outer primaries, the elasticity of the barbs helping to keep them in order (Mascha, 1905, p. 10). The outer vane of the first primary, being the only outer vane completely exposed, is decidedly the most stiffened. Its resistance is augmented by extreme narrowness due to the barbs being set at a much smaller angle to the shaft (compare Text-fig. 1 and Plate 3).

CORRELATION OF OCCURRENCE AND FLIGHT

The markedly different, although intergrading, types of flight in birds have been correlated with lengths of wing bones by Böker (1927). He has given the useful name *Flutterflug* to the rapid-whirring type of flight characteristic of the generally short-winged Anseriformes and Galliformes. The study of Poole (1938) comparing wing areas to weights of birds shows the wing areas of Anseriformes and certain Galliformes to be relatively much smaller than in birds lacking *Flutterflug* flight. Stiffened inner vanes of the primaries thus appear to be correlated both with the type of flight and with short length or small area of wings. The adaptive value of such stiffening, already discussed in regard to the individual wing and primaries, is again indicated in that *Flutterflug* flight causes more air pressure against the wings. Adequate resistance to this pressure must be necessary for efficient flight.

Some species, particularly grebes and some Galliformes (such as quail), have rapid-whirring flight and small wing area (Poole, 1938), but lack a stiffening of the vanes of primaries. Possibly their wings are adapted toward the same end by less noticeable modifications, or they may be less efficient as in having less power of sustained flight. Certain other birds, lacking *Flutterflug* flight, show a marked stiffening of vanes. Moreover, these birds, as well as certain owls (including *Nyctea nyctea* and *Bubo maximus*) and Falconiformes (including *Aquila*), have relatively large wing areas. In some such cases, as with *Aquila* and *Diomedea*, particular habits may reflect a need for stiffened wing vanes. The diving of the eagle with the accompanying great stress on wing feathers when checking speed, and the vigorous flapping necessitated by the albatross in taking off from the water, seem to be such habits. Lastly, in these species, and others such as *Grus*, having stiffened inner vanes but not whirring flight there is a tendency for the birds to be large and heavy. Wing areas listed by Poole (1938) show a probably correlated tendency

for large birds to have smaller relative wing areas. Small birds, as quail, even having whirring flight probably have less strain on their wings just because of this size factor.

The Ruddy Duck (*Erismatura*) appears to be the only one of the Anseriformes lacking marked stiffening of the inner vanes of the primaries. This is of special interest because *Erismatura* is considered to belong to a group, the Erismaturinae, which is primitive in certain respects. This may confirm a functional explanation of the stiffened vane area, suggesting that the condition is an adaptation which developed as the Anseriformes became increasingly specialized.

On the basis of the rather uniform occurrence of the modified primary vanes in the two not closely related orders, Anseriformes and Galliformes, we may consider this condition as an example of parallel adaptation meeting similar needs. The very similar form of the modification (i. e., the expansion of the ventral ridges of the rami) in these birds is of special interest because parallel adaptation is typically accomplished by slightly different modifications toward the same function. The several types of modification of the barbs of rectrices of tree-trunk foraging birds which use the tail for support, serve as an example (Richardson, 1942). It is to be pointed out, too, that the present adaptive condition and its need are generally associated with birds having relatively small wing areas. Apparently, then, similar types of flight and relative wing areas have resulted in parallel adaptation in the feather structure.

EFFECT OF DOMESTICATION

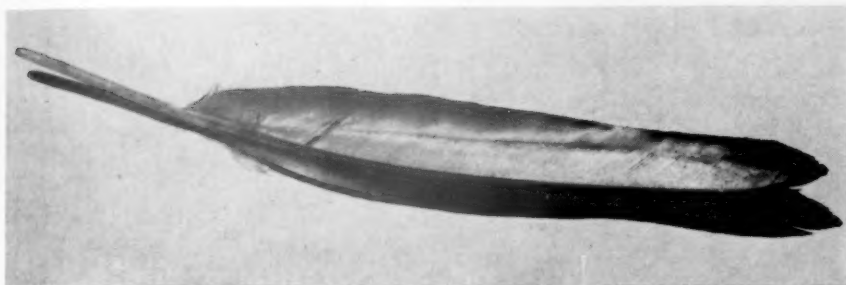
Stiffened inner vanes of primaries were found to be present in domestic ducks, geese, and turkeys. In the several hundred turkey primaries examined, for example, the modification seemed to be just as marked and microscopically the same as in wild birds. We may accordingly consider this condition of the primaries as an adaptation which is retained in domestic birds but probably has neither a beneficial nor a detrimental effect. In contrast to this, other adaptations, such as the length of the wing of ducks or the length of the hind leg of rabbits, show, according to Darwin (1876, vol. 1, pp. 135 and 300) and Holliger (1916, p. 489), marked reduction under domestication. Selective breeding would not encourage such reduction nor could natural selection operate to reduce adaptations now possibly disadvantageous. A Lamarckian theory of disuse or lack of exercise as proposed by Darwin (1876) seems to afford the best explanation but a mechanism for such a theory is not known. For a

further understanding of the whole problem we should study how much modification of different types of adaptations can take place during the development of an individual animal under conditions in which the adaptations are not used.

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RICHARDSON: THE INNER VANE OF THE REMIGES. Second primary of a Wood Duck (*Aix sponsa*), ventral view. The overlapping ridges of the inner rami form the stiffened silvery area. Photograph by Waldo Holcombe.



IVOR: STUDIES ON ANTING. Blue Jay anting. Probably the first photograph to be taken of this behavior. Photograph by Hugh M. Halliday.



FURTHER STUDIES OF ANTING BY BIRDS

BY H. R. IVOR

Plate 3, lower figure

IN a paper on "'Anting' by Birds," McAtee (1938) reviews the articles on this curious phenomenon, citing 28 references and listing sixteen species and six passerine families in which this behavior has been noted. Records of its occurrence in additional species and families have been given by Nice and ter Pelwyk (1940), Ivor (1941), Thomas (1941) and Bourke (1941), so that at present it has been reported in thirty-nine species of thirteen families: Corvidae, Timaliidae, Cinclidae, Mimidae, Turdidae, Muscicapidae, Bombycillidae, Sturnidae, Meliphagidae, Compsothlypidae, Icteridae, Thraupidae and Fringillidae.

In my former paper I described the results of some observations in my aviary during 1940. Since then I have carried out a series of sixteen experiments designed to discover the exact procedure during anting. Grateful acknowledgements are due to Mrs. Margaret M. Nice, Chicago, Ill., for helpful suggestions in regard to the paper, and to Dr. F. A. Urquhart, Curator of Insects, Royal Ontario Museum of Zoology, for identification of the ants used in the experiments.

According to McAtee's notations on the casual observations listed by him, birds have been reported as doing the following: crushing ants and rubbing them into their tail feathers; placing ants under their wings and taking them out again; depositing them among their feathers back of and underneath their wings; placing them under their wings where the action of formic acid would be effective; passing them through the wing, back and leg feathers; anointing the legs, rump and wings; and storing insects under the wings in order to have food with them during migration.

In my experiments, seventy-three birds of nine families and thirty-one species were used. Of these sixty-eight were native, three European and two Asiatic. All were adult except for twenty-five of the native birds.

A shovelful of earth containing several hundred ants was scattered over an area of four to six square feet on the earthen floor of the aviary. After placing the ants, I sat or reclined on the ground sufficiently close to observe the actions of the birds at reading distance. This I was able to do for the reason that over half of the birds were hand-reared and exceedingly tame; so confident, in fact, that some

would ant on my hand. Others had so little fear that I was able to sit beside them. When I believed that about half of the ants had been used, I retired about fifteen feet so as to allow the participation of the shyer birds. Notes were made at the time and transferred to the bird diary as soon as the performance was over.

OBSERVATIONS

Typical performances as noted in my bird diary will cover the season.

Close as I was to the birds—a matter of some sixteen inches from the particular bird I was watching at the moment—I found it quite difficult to follow the movements. Not only was it distracting to have so many birds all performing at once, but the human eye was hardly quick enough to follow them accurately as the performance was of great rapidity. However, as it lasted in its entirety for a considerable length of time—about half an hour—what was missed by the eye during one movement could usually be seen during others—that is, so far as the eye was capable of following such movements.

The moment an ant was sighted by any bird which anted, there seemed to be an instantaneous and instinctive reaction. The ant was picked up and held in the tip of the bill; the eyes were partly closed; the wing was held out from the body but only partly spread; the wrist was drawn forward and raised, thus bringing the tips of the primaries far forward and touching the ground; the tail was always brought forward and under to some extent, on the same side as the extended wing, and often so far that the feet were placed upon it. Stepping on the tail at times caused the bird to fall on its side or even on its back. The ant, which may or may not have been crushed, *was swiftly rubbed on the ventral surface of the outer primary or primaries, beginning, so far as could be seen, just below the wrist and extending to the tip.* I could not determine whether or not the ant was rubbed on more than one primary; whether it was rubbed on the shaft, the margin or the inner web; certainly it was never rubbed on the dorsal surface. No suggestion of what we know as preening was evident, nor was any preening done immediately after, or a short time after, the performance was finished with one exception. On this occasion a female Indigo Bunting (*Passerina cyanea*) flew to a perch and went through all the actions of drying herself as after a bath.

Even after watching for some time I was under the impression still that occasionally the ant was rubbed on the under side of the tail

as reported in my former paper. Closer observation showed, however, that this did not seem to be so in any instance, but that the bird was persistent in reaching the very tip of the primary which often was resting on the tail.

At no time did I see any bird *rubbing the ant on any other part of the plumage or on the legs*, nor did I see a bird placing an ant among the feathers. I found that when a bird seemed to be rubbing an ant on the legs it was in reality picking off the ant which had crawled there and using it on the primary. Sometimes a number of ants could be seen crawling over the body, and these were picked off the breast and from under the partially outstretched wing and used likewise.

These observations show that the sketches in Nice and ter Pelkwyk's paper, although giving a general idea of attitudes assumed in anting, appear to be partially inaccurate in detail.

At times young Wood Thrushes (*Hylocichla mustelina*) made motions which at first seemed to indicate that they were rubbing the ant on the breast, abdomen or flank. Continued close observation showed, however, that although the movement of the bill was in the direction of, and close to, these parts, the ant was not actually touching the feathers. The curious feature here was that at times the ant was then rubbed on the primary before being eaten and at other times eaten immediately after the above movements.

With few exceptions the ant seemed to be used only in one single stroke down the primary. On one occasion I saw a Pekin Robin (*Liothrix lutea*) rub an ant on the primary five times before eating it and several times noticed a bird use the same ant on the primaries of both wings before eating or discarding it. Several time I was under the impression that I saw birds rubbing ants on the ventral surface of the secondaries but could not make sure of this.

The ant, after being used, was often eaten but not invariably. As near as I could judge, the majority were eaten immediately rather than discarded.

I was unable to see any ant clinging to the feathers with its jaws, but numerous times it was evident that an ant had bitten a bird.

There seemed to be no fundamental differences in the specific actions of families, species or individuals, the only variations being in position. This seemed to be determined by the extent to which the tail was drawn forward. Although there was always tail action, it varied from slight to as far forward as was physically possible. This did not apply only to some individual bird or birds, but to all.

Enthusiasm for anting varied with the season. During March, 1941, none of the birds anted. From the middle of April until near the end of July, all of the birds which anted did so enthusiastically. During August, September and October, little interest was shown either in anting or in consumption of ants, in spite of the fact that the temperature on one occasion in September and one in October was over 80° F. in the shade. During February, 1942, semi-dormant carpenter ants were placed before the birds. Eight anted to some extent; the Pekin Robins and the Baltimore Orioles (*Icterus galbula*) continued until all of the ants were used. During March I carried on two experiments with the same species of ant and again only eight birds anted. In both months most of the birds ate the ants, including the Cedar Waxwings (*Bombycilla cedrorum*) and Black-headed Grosbeaks (*Hedymeles melanocephalus*).

During the height of the anting season the act of anting seemed to engender a state of ecstasy so overwhelming that even domination and enmity were forgotten. The Rose-breasted Grosbeaks (*Hedymeles ludovicianus*) are very quarrelsome, but it was rare to see even one of these make a belligerent movement toward another bird during the performance. This, too, in spite of the fact that, at times, from twenty to thirty birds would be going through the performance at one time on a space of four or five square feet, where they were continually bumping against one another.

Twenty species anted: Blue Jay, Pekin Robin, Catbird, Robin, Wood, Hermit and Wilson's Thrushes, Cedar Waxwing, Bobolink, Baltimore Oriole, Cardinal, Rose-breasted Grosbeak, Black-headed Grosbeak, Indigo Bunting, Junco, and Harris's, White-crowned, White-throated, Fox and Song Sparrows.

Ten species did not ant but ate the ants: Flicker, Horned Lark, Brown Thrasher, Bluebird, European Blackbird (*Turdus merula*), Cowbird, Evening Grosbeak, Purple Finch, Greenfinch (*Chloris chloris*) and Brambling (*Fringilla montifringilla*).

The Pine Siskin neither anted nor ate the ants.

The ants used in these experiments were as follows: *Formica sanguinea*, *Lasius niger*, *Tapinoma* sp., and *Camponotus pennsylvanicus*.

SUMMARY

The data show that ants were placed only on the feathers and not among or under them; they were rubbed only on the ventral surface of the primaries, and were not seen to cling to the feathers. They were not rubbed on the legs. Not all of the species having an op-

portunity to ant would do so; not all species of any one family performed; but all individuals of a species which anted also performed. The only variation in actions shown was by juvenile Wood Thrushes. Enthusiasm for anting was much more evident during late April to the end of July than it was in early spring and in the fall. Some ants were eaten and some discarded. The experiments gave no indication as to the biological significance of anting.

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SCARLET TANAGERS 'ANTING'

BY HORACE GROSKIN

THE peculiar behavior of birds known as 'anting,' whereby birds seize ants and place them in their feathers under their wings or elsewhere, crush the ants with their bills and rub the juices on their feathers, or dust themselves in ant hills, has been noted and recorded by a number of ornithologists both in this and other countries. Various theories have been advanced for this rather unusual behavior: that ants are placed among the feathers to drive out ectoparasites; that the bird anoints its feathers with the formic acid secretions of the ant to repel ectoparasites; that the bird eats the ant for the formic acid which may be beneficial as a medication to increase muscular energy, and the like, or to expel endoparasites; that the bird places the ant in the feathers to have a reserve food supply during migration; and other suggestions.

McAtee (1938) reviews the literature on the subject and gives in condensed form the observations, comments and some conclusions as to its biological significance drawn by twenty-six ornithologists in various countries. He also describes in full an observation made by E. R. Kalmbach in 1935 of Starlings anting in Washington, D. C.

In view of the fact that the accounts of anting in this country are

limited, it appears worth while to record a new species, the Scarlet Tanager (*Piranga erythromelas*).

On September 23, 1941, in late afternoon, I was watching a large banding trap through a window at my home in Ardmore, Pennsylvania. The trap is located on the lawn twenty feet from the window and about five feet below it. As I was watching this trap, an adult male Flicker (*Colaptes auratus luteus*) arrived and started feeding on the ground immediately adjacent to the side of the trap. I noted with field glasses through the window that he was seizing and eating winged, dark-colored ants of which there was a swarm emerging from the ground. He fed for about fifteen minutes and left. Shortly afterwards, another adult male Flicker arrived, and he also fed in the same place and in the same manner as the other one, for about ten minutes. Neither of these Flickers rubbed the acid secretions of the ants on their feathers or attempted any form of anting.

On October 2, 1941, at about 4 P. M., I was again at the window watching the banding trap when I noticed a swarm of winged, dark-colored ants on the ground alongside the trap at exactly the same place where the Flickers had fed a few days before. The swarming ants covered an area of about two square feet, and many of them were flying in the air and through the wire mesh of the trap. A few minutes later, I saw another swarm of the ants in the grass almost directly below the window. This swarm was much larger than the other one, covering an area of about five square feet, and not only were the ants emerging from the ground in large numbers, but the air was literally filled with them and several even landed on the window panes through which I was looking. During this time, there were a number of birds feeding on the ground or at the bird feeders within five to fifty feet of both swarms of ants. These birds showed no interest whatever in the ants. The species present at the time were one Northern Downy Woodpecker (*Dryobates pubescens medianus*), two Tufted Titmice (*Baeolophus bicolor*), one Catbird (*Dumetella carolinensis*), three Eastern Robins (*Turdus m. migratorius*), and two Purple Grackles (*Quiscalus q. quiscula*).

While I was watching the birds and the swarming ants, two Scarlet Tanagers (*Piranga erythromelas*) suddenly flew in and alighted on the ground in the center of the larger swarm of ants located directly under the window, and immediately started anting. Tanager 'a' continued to ant persistently for more than one hour with short interruptions from time to time, while tanager 'b' alternated between the two swarms, flying from one to the other every few minutes. The

distance between the two swarms was about fifteen feet and both could be seen easily from the window. Tanager 'a', which remained with the larger swarm of ants for the entire period, would seize an ant from the ground in its bill, spread and raise its wing slightly, and put its head with the ant in its bill under its wing where it remained for a period of a minute to a minute and a half. Then the head would come out from under the wing with the ant gone from the bill. The bird would then straighten up, look around for a few seconds, seize another ant from the ground and repeat the performance, changing from time to time from one wing to the other. The entire action was most deliberate, without any indication of hurry or excitement whatsoever. While the bird's head was under its wing, I could detect no movement either of the body or the wing. This led me to infer that the bird did not rub the ant on its feathers to benefit from its secretions of formic acid; it appeared, rather, as if the bird were holding the ant in some particular place so that it might attach itself to the feathers. McAtee (1918) calls attention to the tendency of ants, when disturbed, to seize the nearest available object with the jaws in a grip so persistent that they often die without relaxing it. It was also noted by Réaumur (1734-1744) that the great strength of ants is in their mandibles.

Since tanager 'a' apparently did not rub the ant on its feathers, and since it is hardly likely that it conveyed the ant under its wing for the purpose of eating it there, it appears possible that it intended the ant to attach itself to the feathers, perhaps to provide food during the bird's migration. It is also possible that the bird placed the ant among its feathers to rid itself of ectoparasites. The ant, disturbed by being held in the bird's bill, would exude formic acid, which, according to Wheeler (1926), is a poison used by ants in attacking their enemies or defending themselves. Wheeler (1910) also writes that in the western states and in Mexico garments are sometimes freed of vermin by being placed on large ant hills of *Formica* and *Pogonomyrmex occidentalis*. It is also suggested that possibly the bird held the ant at a special place among its feathers until the ant would exude formic acid onto the bird's skin, which had been irritated by ectoparasites. The formic acid may possibly be beneficial to the bird as a medication to soothe or cure the irritation of the skin caused by these parasites. According to the 'Merck Index,' 4th edition, a medical encyclopedia, formic acid is used externally in human medication, chiefly as a counter-irritant in painful local affections.

Tanager 'b's' anting behavior was similar to that of tanager 'a' so long as it was with tanager 'a' at the larger swarm of ants, but when it flew to the smaller swarm, instead of seizing the ants and putting them among the feathers under the wing, it would seize the ants rapidly, one after the other, and eat them, and this it continued to do every time it flew over to the smaller swarm. However, in one instance, tanager 'b', while anting with tanager 'a' at the larger swarm, seized an ant and rubbed it under the upper tail-coverts for a moment and then resumed anting in the same manner as tanager 'a'. When it finished rubbing the ant under the upper tail-coverts, I was unable to see whether it ate the ant or dropped it. Nice and Pelkwyk point out that Steiniger (1937) and Palmgren (1937), after a number of feeding experiments with birds, reached the conclusion that ants, on the whole, are protected by their taste, with which conclusion Nice and Pelkwyk agreed. However, tanager 'b' not only did not show any aversion to ants, but ate a considerable number of them with apparent satisfaction. Formic acid, in very small quantities is used internally in human medication, as a diffusible stimulant ('Merck Index'), and perhaps tanager 'b' was eating the ants for that purpose. Forbush (1929) writes that the Scarlet Tanager takes ants. Roberts (1936) writes that the food of the Scarlet Tanager is mainly animal matter including ants.

Both tanagers left the premises shortly after 5 P. M., having anted for over one hour. After the birds were gone, I examined the ground near both swarms of ants and found a large number of ants still present. I did not find any dead ants. Upon my examination of the ground the following morning, the ants had disappeared but late in the afternoon they reappeared. The tanagers, however, did not return and the other birds present at the time did not attempt to ant.

Two of the winged, dark-colored ants were later collected at the location of the swarms, both females (queens), which were identified tentatively by Ezra T. Cresson, Jr., Associate Curator of Insects, Academy of Natural Sciences of Philadelphia, as *Lasius (Acanthomyops) claviger* (Roger). This identification was later definitely confirmed by M. R. Smith, Associate Entomologist, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C. I wish to express my thanks to both of these gentlemen for their assistance.

The chemical composition of the excretion of *Lasius claviger* is formic acid. This acid is produced in considerable quantity only by the species of certain Formicine genera such as *Lasius*, *Formica*, *Camponotus*, etc.

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'ANTING' BY ROBINS

BY CHARLES K. NICHOLS

SEVERAL notes have appeared recently in ornithological literature regarding the subject of 'anting' by birds. In connection with this matter the following observations may prove of some interest.

On August 3, 1941, at about eight o'clock in the morning, I noticed a male Robin (*Turdus migratorius migratorius*), on my lawn at Ridgewood, New Jersey, which was very obviously engaged in anting himself. He would pick an object from the ground and quickly place it under one of his partly opened wings, as has been frequently described, and sometimes on the under side of the tail. In his efforts to accomplish the latter he would assume most grotesque postures, similar to those illustrated in an article by Nice and ter Pelkwyk (*Auk*, 57: 520-522, 1940) and frequently would lose balance and fall on his back as noted by Ivor (*Auk* 58: 416, 1941). At other times he would press his breast to the grass and partly rotate his body with this contact as a pivot.

After this had continued for about fifteen minutes, another male Robin appeared and drove the first from the spot. Settling on the favored point, he duplicated, as far as I could discern, the procedure of the first. While the new arrival was in possession, Robin number one sat on the lawn about ten feet away, quietly watching.

When bird number two had enjoyed the spot for several minutes a third male swooped down, drove number two away, and took his place on the anting point. Number two now joined number one as audience.

From that time the procedure was that of rotation. After one bird had occupied the anting point for a few minutes, one of the others would approach him threateningly, drive him from the spot and usurp the favored place. Only for a short time, however, would he be permitted to remain there unmolested; then he, in turn, would be driven away and replaced by another.

At one time, when a passer-by had frightened the birds and they had flown up into the trees, I went out and made a hasty examination of the spot. I found a swarm of about one hundred ants milling around rather excitedly in a space about one foot square. I could see none that were maimed or crushed but there were three that appeared to be dead and these were being carried about in the mandibles of members of the swarm. A sample of the ants was taken and these were later identified by Dr. William S. Creighton as workers of *Formica fusca*, probably the variety *subaenescens*.

As soon as I left the Robins returned and resumed their routine of rotation and this was kept up for about thirty minutes more. I could see nothing that indicated that any of the ants were eaten and, so far as I could determine, the feathers showed no moisture as might have been expected if the secretions of crushed ants had been used for dressing the feathers. When they had left I examined the spot again but found not an ant in sight.

In an article on "'Anting' by Birds," McAtee (Auk, 55: 98-105, 1938) lists a number of reasons that have been suggested for this custom, one of these being the "simple use of ant hills as dusting places." This reason can be discarded in the above case, however, for at this point there was no ant hill nor any trace of dust or sand.

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'ANTING' BY THE ROBIN AND TOWHEE

BY JOSSELYN VAN TYNE

THE published accounts of 'anting' by birds have been summarized by W. L. McAtee (Auk, 55: 98-105, 1938) and Margaret M. Nice and ter Pelkwyk (Auk, 57: 520-522, 1940) but I never fully believed in the occurrence of this most improbable phenomenon until I recently saw it with my own eyes.

On the evening of July 10, 1942, soon after sunset, I saw a male Robin (*Turdus migratorius*) preening himself on the lawn 15 feet from our window. The bird was preening much more vigorously than is customary and his actions were further remarkable for the frequency with which he preened in a single motion the whole outer edge of the wing from wrist to tip. In fact, this wing preening was done so violently that the bird repeatedly fell down at the end of the preening motion and once this ended in a complete somersault. Sometimes the bird preened the tail or body plumage but more often he concerned himself with the wing. Almost immediately I noticed that nearly every preening was preceded by a hasty picking of some small object from the ground and I realized that here at last was a bird 'anting'. Several times the Robin crouched and seemed to rub its body against the ground. Twice he ran off out of sight but returned almost immediately to resume anting at the same spot as before. Clearly the bird was mainly concerned with preening and I saw no evidence of its swallowing anything. Nor did there seem much chance that any ants could have survived the violent treatment they received.

After more than five minutes of this, the Robin ran off out of sight and was almost immediately replaced by a female Towhee (*Pipilo erythrophthalmus*) that came to the same spot and briefly but definitely preened and anted. After the Towhee left, a Catbird came several times to the spot but seemed to detect us at the window and scolded and flew off to the bushes nearby without doing any preening.

Specimens of the ants which I found swarming in considerable numbers about the anting ground were identified by Frederick M. Gaige as *Tapinoma sessele* (Say), a weak, non-predaceous, aphidicolous species.

I have found no earlier records of anting by either the Robin or Towhee.

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REPRODUCTION IN ENGLISH SPARROWS¹

BY RICHARD LEE WEAVER

INTRODUCTION

BARROWS (1889) indicated that the English Sparrow (*Passer domesticus*) nested somewhere in the United States in every month of the year. The Barrows report on the status of the English Sparrow was based on some field work by its author but primarily upon the reports from observers located within the range of the species at that time, which was east of the Mississippi River. Many of these records were sent in by untrained observers, including many postmasters who received the questionnaires. As has been experienced by this writer, dates of nesting of this species gathered by means of questionnaires are apt to indicate the carrying of nesting materials rather than definite egg records. Certainly the data obtained by a two-year study at Ithaca, New York, and by summarizing the citations in standard regional references, do not bear out the early assumption contained in the Barrows report. As Stone (1937) points out, "Even this familiar bird would seem to warrant further study."

SEASON OF NESTING

In an earlier statement I showed (1939a) that the season of nesting in Ithaca, New York, was from the first week of April to the beginning of September. This seems to be the average for most of the country, but as one would expect, dates in Florida and other parts of the South may be a few weeks earlier, while those in Canada in the northern limits of the range may be a few weeks later. One definite record from Florida made by Dr. Joseph Howell seems to bear this out as he found a set of eggs as early as March 2. The earliest Canadian records reported in answer to a survey made by letter were: Saunders, April 20; and Snyder, April 24, which I reported previously (1939b).

At Hanover, New Hampshire, I found that the season of nesting began about two weeks after it did in Ithaca. The Hanover Inn, which contains many suitable nesting sites, was inspected on May 9, 1939 and 1940. Nine nests were occupied in 1939; two of these contained young which were three days old. Twelve nests were occupied in 1940 of which two contained young. The oldest nestling was four

¹ Scientific Contribution, No. 8, of the Biological Institute of New Hampshire. Paper presented in part at the annual meeting of the American Ornithologists' Union held in Charleston, South Carolina, November 1937.

days old while the remaining three in the same nest were three days old and those in the other nest were still younger. If twelve days are allowed for incubation and three days for egg laying, the first egg was deposited April 26 or 27.

One outstanding example of winter breeding, where the eggs and young were actually observed, has been recorded by Dr. Clarence Cottam for Utah (1929). He found a nest with five eggs hatching January 1, 1929, and observed the brood to leave the nest successfully eighteen days later. This is very unusual for this species despite the many alleged records for the species.

Forbush (1929) gives the extremes for nesting in Massachusetts as April to August and this is repeated by Bagg and Eliot (1937) for the western part of the State. This is much more nearly accurate than Minot's (1895) statement for New England that "they begin to build their nests even in winter." Stone (1937) observed birds carrying nesting materials at Cape May, March 18, but did not see flocks of young until June 30. Others including the writer have witnessed the carrying of nesting materials during most of the months of the year (1939b). This seems to be where so many people err in reporting the nesting time for this species. Bailey (1913) says for Virginia: "In favorable localities one may find nests with either eggs or young seven months out of the twelve." Wayne (1910) says for South Carolina, "the breeding season is a long one, beginning in March and ending in September, the 21st of the latter month being my latest date." Roberts (1936) states that "nesting begins in Minnesota as soon as weather conditions will permit, usually in March or early April, and continues throughout the summer and early fall." They were observed carrying nesting materials at St. Paul in December and February (Thompson), and Roberts adds, "it is not probable that eggs would be laid at that season in this country." Nice (1931) gives the following records for Oklahoma: "Nesting: Tulsa—eggs April 10—June 5 (E. Palmer); latest broods of small young August 21, 1930 (Mrs. A. E. Gilmore); Norman—young a week old found March 20 and August 21, 1930; adults carrying nesting materials from November—August (Nice); Kenton—nests from March till November (R. C. Tate)." Dawson (1923) gives the season for California as "March to September." Grinnell and Wythe (1927) restrict it to "March to August" for the San Francisco Bay region.

Niethammer (1937) gives the season for egg laying in Germany as "more by exception in March, for the most part from the first to the middle of April, throughout the summer till about the end of

August." Witherby (1938) says the breeding season in England "usually begins in May and as two or three broods are usually reared fresh eggs may be found till July or August, also exceptionally in almost every month."

RANGE OF THE SPECIES

Although I have previously discussed (1939a) what is known of the present northern range of this species, I wish to record two additional items of information which have been brought to my attention by Dr. Harrison F. Lewis. Baie Comeau, Saguenay County, Quebec, is probably one of the stations on the eastern periphery of the range in Canada. It is located on the north shore of the St. Lawrence estuary in latitude $49^{\circ} 14'$ north, longitude $68^{\circ} 9'$ west. Dr. Lewis found two males here on May 28-29, 1940. The birds remained in each other's company and did not appear to be attached to any restricted territories. Dr. Lewis likewise states that he has not found the birds at any point east of Baie Comeau on the north shore of the St. Lawrence estuary and gulf. There is no certainty that the species is permanently established or will succeed in establishing itself permanently at this place.

Dr. Lewis also reports that the station at Moose Factory, Ontario, which has been visited by English Sparrows at various times, no longer supports the species. He visited Moose Factory September 15-23 and October 5-6, 1940, with Harold S. Peters. They did not see any English Sparrows here or at any other place in the James Bay region.

BROODS RAISED IN ONE SEASON

Since one individual nest may be used by three or more different females in one season, the actual number of broods raised by one female in a season is questionable. Two banded females are known to have raised but two complete broods in one season while one nest site is known to have been used four times with three successful broods. Therefore, it is suspected that the large number of broods claimed by some writers may refer to clutches per nest site rather than broods per female.

Knight (1908) says "the number of broods reared in Maine in a season varies but is always at least two and in some instances certainly as many as five." Grinnell and Wythe (1927) report that "two and even three broods are reared each year" in the San Francisco Bay region. Howell (1924) states for Alabama, "three or more broods are reared in each season" and repeats the statement for Florida (1932).

Barrows (1889) says for Michigan: "Two broods at least are reared in a season and usually three, while instances of four and five have been reported by competent observers." The statements by Saunders and Clarke (1927) and by Witherby (1938) about the bird in England—"three broods are frequently reared in one season"—closely parallels the more conservative and general estimates for the United States. Niethammer (1937) says about the same for Germany, however,— "yearly brood number is apparently regularly three, sometimes said to be four, but with specimens not yet two years old perhaps there are even only two." He also comments pertinently, "often the broods follow one another in quick succession, however, it is not thoroughly cleared up how often matings for a single brood or for a year or lasting even longer, occur."

CLUTCHES PER NEST SITE

In the area studied at Ithaca, New York, during 1937, fifty-two nest sites were occupied. Observations were made weekly on all sites and in many instances daily checks were made. Twenty-six of these sites produced one clutch each, while sixteen sites produced two, six produced three, and four produced four clutches; none contained more than four during the season. However, in the four instances where four clutches were laid, the first sets were interrupted and the females deserted their eggs. An average of 1.68 clutches per nest site was maintained disregarding the four interrupted nests.

NUMBER OF EGGS IN THE CLUTCHES

The number of eggs laid by English Sparrows has been listed in regional references as follows: Forbush (1929), four to nine eggs; Roberts (1936), four to eight eggs; Pearson (1936), four to seven eggs; Wayne (1910), four to six eggs, five being the rule, while six are rare; Bailey (1913), four to six eggs is a full set with us; Chapman (1929), four to seven eggs; Knight (1908), four to nine eggs, generally five or six; Howell (1924 and 1932), four to seven eggs, for both Alabama and Florida; Saunders and Clarke (1927) (England), five to six eggs; Dawson (1923), four to six eggs; and Eaton (1914), six to eight eggs. Witherby (1938), (England), eggs three to five, occasionally six or even seven; eight also recorded. Niethammer (1937) (Germany), usually five or six, seldom four or seven, only exceptionally eight.

At Ithaca, New York, in the 1937 study, thirty-eight sets were selected from the total number of clutches under observation as being

free from disturbance which would affect the normal production. Only one of the thirty-eight sets had six eggs and none was ever found to have more. Twenty-seven sets had five eggs each, nine sets had four eggs and one set had but three. The average for the thirty-eight sets was 4.73 eggs per set.

In the two cases where marked females laid a second set of eggs, the same number of eggs was laid each time. A comparison of the numbers of eggs in the first half of the season with those in the latter half does not show the expected smaller number of eggs per set. In the nest sites having three or four broods, one had two sets of five eggs followed by three sets of four, one had two sets of five followed by one set of four and then finished with a set of six eggs. Another site had two sets of four eggs followed by two sets of five eggs. A fourth site had two sets of four eggs followed by two sets of five. Two others had three sets of five eggs, while still another showed this sequence: one of four eggs, one of six, and a last one of five. One site had three sets of four eggs.

It was apparent that the same females did not lay continuously in the same nest site. Some birds laying near the end of the season might have been laying for the first time. One would expect the later sets to be smaller only if the females were laying a second, third, or even fourth time. Although the general comparison as indicated in the above nest sites tends to disprove a decrease in productivity, more extensive banding and following of nesting females will be necessary before a final decision can be reached.

DESCRIPTION OF THE EGGS

Forbush (1929) presents the following description of the eggs of English Sparrows: "Ovate, dull, grayish white, spotted and speckled with reddish brown or dark brown and gray but color variable." Some eggs tend to be greenish brown. The color varies so greatly in different sets of eggs that it would be hard to give a briefer description than that of Forbush. But Niethammer (1937) gives a further account as follows: "Eggs—very variable with basic color almost pure white, greenish or bluish, less often green-gray or brownish. Marks limited to a few gray or brown dots, usually consisting of closely packed, clouded or sharply limited spots, which vary from deep black-brown through all tone ranges to bright ashy gray and can crowd in toward the blunt end (of egg), however, without forming a genuine wreath structure. Usually the last egg is abnormally colored; basic color brighter, spotting more pronounced and not so frequent. Like-

wise the next to the last egg has a darker basic color and very dense marking." The range of variation can be shown photographically from a pure white or gray to a very dark and speckled brown or a greenish brown.

Within the sets the eggs are rather homogeneous in color, size, and markings. If the eggs have a light background with contrasting spots in the pattern, each egg will generally conform and if mixed with others can usually be identified. In one instance where two types of eggs were found in one nest, it was discovered that two females were laying eggs in the same nest. Occasionally the last eggs laid are slightly lighter due to a little less pigment.

SIZE OF THE EGGS

Measurements of twelve sets of eggs were taken. There were fifty-four eggs. The greatest length recorded was 25.0 mm. and the greatest width was 16.8 mm. The smallest length was 20.2 mm. and the smallest width was 14.5 mm. The average length for the fifty-four eggs was 22.78 mm. and the average width was 15.41 mm.

The individual variation of the eggs in a set was remarkably small. The longer eggs were usually not as wide as the shorter ones, although this was not always true. Unusually small eggs, such as the ones found often in Chipping Sparrow nests, were never encountered.

The measurements in Table I were made on the different sets of eggs.

John C. Phillips (1919) reports on a lecture given by Bumpus (Biology Lecture, 1898) in which he showed, "that of 1736 sparrow eggs, one half English and one half American, the American eggs had become shorter and more spherical and much more variable in color and pattern—concluding that the American eggs had been subject to a slightly and perhaps less selective environment." He also says: "The English Sparrow has changed very little in outward appearance and gross measurement during his sojourn in America."

Saunders and Clarke (1927) give the egg size of British birds as 23.0 mm. by 15.0 mm., which is not much different from the average of 22.78 by 15.41 mm. for the eggs measured in this study. Witherby (1938) gives the average size for 100 British eggs as 22.51 mm. by 15.65 mm. with maxima of 25.3 x 15 and 23.5 x 16.5 and minima of 19.7 x 15.5 and 22.5 x 14.5 mm. Niethammer (1937) gives the average as 22.2 mm. by 15.6 mm. for 100 Saxony eggs.

Chapman (1929) records the egg size for Eastern North America as 1.86 by 0.62 inches, which is obviously a mistake and should be 0.86 x 0.62 inches which would be 21.8 mm. by 15.7 mm. Forbush

TABLE 1

<i>Family</i>	<i>No. of eggs</i>	<i>Length</i>	<i>Width</i>	<i>Average</i>
BS2Lb	4	24.0 mm.	16.0 mm.	23.75 x 15.87
		24.5	16.0	
		22.5	16.0	
		24.0	15.5	
BS2Lc	6	23.0	15.5	23.91 x 14.83
		24.0	15.0	
		24.0	16.0	
		25.0	16.5	
		24.0	16.0	
		23.5	16.0	
B1b	6	22.3	15.0	22.1 x 15.1
		22.5	15.0	
		21.5	15.5	
		22.0	15.0	
		21.9	15.0	
		22.4	15.1	
B4b	5	21.5	15.3	21.7 x 15.0
		22.0	15.5	
		21.8	15.5	
		21.9	15.5	
		21.5	15.4	
B5b	5	22.0	16.8	22.58 x 16.36
		22.3	16.7	
		22.7	16.0	
		22.7	16.5	
		23.3	15.8	
B7a	5	23.2	15.7	22.82 x 15.8
		22.5	15.5	
		22.4	16.0	
		22.8	15.8	
		23.2	16.0	
B16	4	21.4	15.4	21.4 x 15.15
		20.4	14.5	
		22.0	15.5	
		21.0	15.2	
NE1	5	22.8	15.5	23.1 x 15.5
		23.5	15.6	
		23.5	15.6	
		23.7	15.5	
		23.0	15.3	

TABLE 1—*Continued*

<i>Family</i>	<i>No. of eggs</i>	<i>Length</i>	<i>Width</i>	<i>Average</i>
Sm1a	4	24.5 mm. 22.2 24.0 25.0	16.5 mm. 16.5 16.5 16.0	23.92 x 14.9
Sm1c	2	23.6 23.6	16.7 16.0	23.6 x 16.35
SL4a	5	23.0 22.0 23.0 23.0 23.0	16.0 15.5 16.0 16.5 15.3	23.8 x 16.1
SL4c	3	22.3 20.2 22.5	15.7 15.0 15.3	21.68 x 15.5
			General average	22.78 x 15.41

(1929) sets minima of 21.3 mm. for length and 15.2 mm. for width, and maxima of 22.8 mm. for length and 15.7 mm. for width. Roberts (1936) gives the measurements as 22.3 by 15.2 mm. An average of these measurements is 22.3 by 15.4 mm. and is approximately the average of the present study, as well as that for the British birds. These figures differ widely however, from those given by Bailey (1913) 21.5 by 20.0 mm. and by Wayne (1910) 21.8 by 18.2 mm., both of which must not represent very many measurements.

LOSS OF WEIGHT IN THE EGGS

The loss of weight in the eggs during incubation was recorded for nine nests. The greatest per cent of loss of weight recorded can be

TABLE 2

<i>Family</i>	<i>No. of eggs</i>	<i>No. of days</i>	<i>Initial wgt.</i>	<i>Final wgt.</i>	<i>Grams lost</i>	<i>Grams lost/egg</i>	<i>Total %loss</i>	<i>%loss per day</i>	<i>Wgt. lost/day/set</i>
BS2Ra	5	2-10	14.15	12.5	1.65	.33	11.6	.8	.206
BS2Lb	6	2-10	18.25	17	1.25	.20	6.8	1.5	.153
BS3La	3	1-12	9.8	8.5	1.3	.43	13.3	1.3	.18
BN1La	2	1-10	5.45	4.9	.6	.3	10	.9	.06
R1W	5	1-9	14.25	12.3	1.9	.38	13.6	1.5	.21
B1a	5	1-8	13.5	12.4	1.1	.24	8.9	1.4	.13
R2W	5	5-11	13.18	12	1.18	.23	9	1.5	.19
K1W	5	1-6	13.4	11.6	1.8	.36	14.9	1.8	.3
TNW1	5	1-9	11.8	10.7	1.1	.22	9.4	1.4	.12

seen in Family K1W in Table 2 below. It was a loss of 14.9% for five eggs for a period of six days. The lowest loss of weight recorded occurred in Family BS2LB which was 6.8% for six eggs over an eight day period. An average for all of the families of the weight lost per egg per day was 1.34% or 10.8% per family per day.

Table 2 shows the data of nine nests used including the loss recorded, the time involved and the average loss.

INCUBATION

Only the female incubates the eggs. The male was never observed to sit on the eggs and no brood spot was found on that sex. Females were either caught or flushed from the nest in numerous instances. The female was also observed to leave the nest in the morning and to be the last or only one to enter it during the day. The male did not usually enter the nest but was seen to bring some nest lining materials to it several times after incubation began. Witherby (1938) says: "Incubation begins on completion of the clutch and chiefly by hen but males take turns." Niethammer (1937) says: "Brooding begins after last egg and both sexes sit and change places with fair regularity [Groebels, *Beiträge Fortpflanzung Biologie* (1932)]." It might be easy to misinterpret the presence of the male at or even in the nest during incubation with actual incubation. Even though the bird might enter the nest, I do not think that it ever assists the female in incubating.

The females observed spent most of their time during incubation on the eggs. They left for rather short periods to obtain food. The males were never observed bringing them any food. In fact they were very little in evidence during most of this period and it was rather difficult to determine which males belonged to the various nests. This apparent lack of interest changed immediately when the young hatched.

The exact time that incubation began was difficult to determine, but by continuous examination of many nests and by deduction it was decided that it must have begun with the laying of the third egg in most cases. The eggs were found to be cold until that time except during the period from six to ten o'clock in the morning when the females entered the nest to deposit the egg for the day. During the first three days, however, the females often did enter the nest at night, but it is questionable whether effective incubation took place. In most cases the first three young hatched at about the same time. Jourdain (1938) believed that incubation began upon the completion

of the set and that the period extended twelve to thirteen or fourteen days. From the evidence which I obtained, I think that his statement will have to be qualified.

By using the two definite dates, the time when the first egg was laid and the time when the first young hatched, and then deducting the three days when no or little incubation took place, the incubation period was determined. The time between the laying of the last egg and the time when the last young hatched was also useful in checking the length of the incubation period.

Twenty-two nests were selected for determining the incubation period. Fifteen days were required on the average from the laying of the first egg to the hatching of the first young. Thus when the three initial days of egg laying are subtracted, the incubation period becomes twelve days. The minimum incubating time was ten days and the maximum was sixteen days, but it is possible that incubation may have started before or after the laying of the third egg. Three of the twenty-two sets required thirteen days, nine required twelve days, one required eleven days, and three sets required ten days.

Very little has been said about the incubation period of this bird in the literature. Forbush (1929) gives the period as thirteen to fourteen days and Roberts (1936) cites Forbush, while Dawson (1923) omits it entirely. Very few of the people contacted by letter could give me any information about it. Saunders and Clarke (1927) give the period for British birds as twelve to fourteen days, corresponding to Witherby's statement (1938) of twelve or thirteen to fourteen days and with Niethammer (1937) who gives it as thirteen to fourteen days. Knight (1908) makes this statement for Maine: "Incubation—fourteen days in the early part of the season and only twelve days in the summer." I have no evidence to support this statement.

HATCHING

A clicking sound usually announces the readiness of the young to start hatching. It is made by contact of the egg tooth with the shell and possibly also by a clicking together of the mandibles. The egg tooth presses against the shell and makes an upraised crease around the larger end of the egg about one-fourth the way from the end. The young bird may break the shell with the egg tooth before the crease is noticeable. In either case, a slit now appears, starting at a point where the egg tooth first pushed through the shell. The slit is made in a circular direction around the egg and meets the point where it started. The young is able to turn itself or its

head in the egg making a complete circular slit possible. The head is located in the larger end of the egg and as the slit nears completion the piece of shell around the head is broken off and the head is freed. The larger piece of shell is now kicked free and the young forces itself out. The feet are crowded into the depressions on either side of the neck while in the shell, and after hatching they have a tendency to remain doubled up for several hours. Often the shell does not come free from the young immediately and the female will help to remove it, and when so doing may often carry the young and the shell out of the nest causing early death to the unfortunate young.

Since the first two or three eggs laid are incubated about the same length of time, they often hatch at about the same time. The others usually follow within twelve to twenty-four hours and never require more than forty-eight hours. Two or three days are required, therefore, for a set of eggs to hatch completely.

The following list of families required these times to hatch, counting from the pipping of the first egg to the hatching of the last egg:

TABLE 3

<i>Family:</i>			<i>Family:</i>		
BS1R	4 young	30 hours	R2W	5 young	24 hours
BN1Lb	3 "	24 "	TNW1	2 "	24 "
B1a	4 "	36 "	N2W	3 "	30 "
B1b	4 "	24 "	S1W	4 "	24 "
	5 "	48 "	SL5	3 "	24 "
B6	3 "	24 "		5 "	48 "
	4 "	48 "			
B14	3 "	24 "			
	5 "	48 "			

The percentage of hatching varied from 0% to 100%. In the majority of cases all of the eggs hatched. In one case a female laid two sets of eggs, all of which were infertile, probably due to the lack of synchronization in the oestrous cycles of the male and female. In one or two instances the young broke the shell but were unable to force their way out and died before hatching. Infertile eggs were recorded in only six of the sets out of the 91 examined in the two-year period.

SUMMARY

1. The season of nesting is from April to September for most of the United States but may start as early as March 2 in the South and may be delayed until near the first of May in parts of Canada and in Europe.

2. Two and possibly three broods are raised by one female although one nest site may be used as many as four times in one season.

3. Five eggs are laid in the majority of cases, with as many as nine recorded in the literature, but not more than six were recorded in this study. Four seems to be the minimum when nests are undisturbed.

4. Eggs vary considerably from one set to another but have great similarity in size, shape, and color pattern within the sets.

5. The eggs average 22.78 by 15.41 mm. in size, which compares very closely with the average given by Witherby for English birds and by Niethammer for German birds.

6. The average loss of weight per egg per day was 1.34%.

7. Incubation requires twelve days. The difficulty of determining exactly when incubation begins accounts for some of the variation in the records and in this study.

8. Two to three young hatch at about the same time and are followed by the remainder of the brood in one day or at the most two days.

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SPREAD OF THE STARLING AND ENGLISH SPARROW

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My studies of the forty years of Bird-Lore (now Audubon Magazine) Christmas censuses have revealed much data on the spread and abundance of the Starling (*Sturnus vulgaris*), and it seems desirable to present some of the material in advance of a report covering the census studies as a whole.

The Starling is, of course, still spreading and likewise is still increasing in numbers in the area back of the advancing front. The increase will undoubtedly continue for two or three decades to come, though the spread should be substantially completed—if the past mirrors the future—within a decade.

It should be borne in mind that the census data are rough in character (as indeed most observational data must be). The published records of first arrivals given in this study may not always mark the actual first arrivals even though reported as such. This discussion and interpretation, therefore, will be confined to the broader and more general aspects of the Starling spread; hence, details of distribution will not be considered.

Many attempts were made to establish the Starling in America both before and after 1890,¹ but for the purposes of this discussion, its introduction will be considered to be the New York liberations of 1890. Its date of *establishment* is assumed as 1895.

The task of tracing the spread of the Starling proves to be a difficult one indeed. Many accidental movements have occurred through unusual winter wanderings and by wind transportation as well as by unknown causes. The early appearance of the species in Labrador and some southern states, for example, as well as recent appearances at Churchill and Moose Factory, should probably be considered as instances of accidental distribution rather than of true spreading.

The first appearance of the Starling in the Christmas-census reports for each state is shown in Text-figure 1A. Isopleth lines at five-year intervals indicate the progressive spread. In reading this map (as well as those that follow) it should be borne in mind that, as I have explained previously, only the general aspects of the spread are considered. From the broad view of continental geography, it is a minor matter whether an isopleth line is half a state one way or another. Although half a state seems a large area to a person living in it, yet from the standpoint of a continent of eight million square miles, it is rather small.

In order to compare the first appearance in each state as revealed by the census data with the first appearance as indicated by published reports, I mapped the Starling reports area by area as found in standard sources at my disposal. I have made no attempt to search the literature exhaustively; my purpose is served well by the standard publications, and I leave the refined search to others having access to more material. Upon averaging the dates of appearance shown

¹ Phillips, John C. 'Wild Birds Introduced or Transplanted in North America.' U. S. Dept. Agr., Technical Bulletin No. 61, 1928.

on the maps, I find that the census reports average slightly less than five years later than the published reports. From the standpoint of time, the difference is greatest in the early years, and from the standpoint of geography, greatest in the southern states. At the present time the dates of appearance as reported by the censuses lag little behind the published reports. The published reports indicate that the spread of the Starling is forecast by the arrival of winter stragglers; breeding lags behind by about five years. The Christmas-census reports of the earlier years probably can be taken as rough indicators of the spread of the Starling as a breeding bird.

The patterns indicate a more rapid spread through the southern and south-central states than through the northern states, though in recent years the spread has been about equal (Table 1). It also

TABLE 1
MILES OF AIR-LINE SPREAD OF THE STARLING AT SUCCESSIVE PENTADS

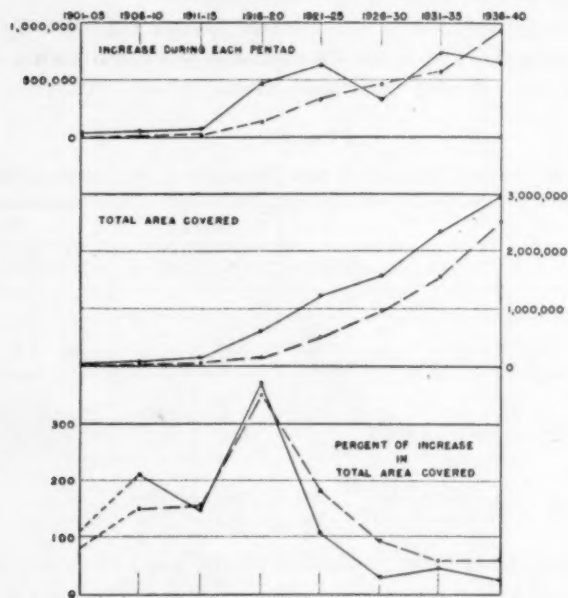
Direction	Pentad							
	1901-05	1906-10	1911-15	1916-20	1921-25	1926-30	1931-35	1936-40
West:								
Census	15	61	225	475	621	1059	1193	1917
Published	72	229	367	497	1159	1289	1748	2127
West-Southwest:								
Census	21	67	116	426	803	1390	1692	1898
Published	105	286	478	1015	1113	1558	1748	1983
North-Northwest:								
Census	78	140	201	243	304	383	487	727
Published	82	203	262	596	720	—	—	—

shows a more rapid progress during recent years than in earlier ones. The more open country of the prairie region and its fewer cities and towns would appear to reduce the number of suitable stopping places. In addition, the prairie country has fewer fruits in comparison with

TEXT-FIG. 1. A—Isopleths of the Starling spread as indicated by its appearance in the Bird-Lore Christmas censuses. The broken line indicates the known advance not yet revealed by the censuses. B—Isopleths of the English sparrow spread. The data previous to 1883 have been taken from Barrows's report supplemented by later evidence; data subsequent to 1883 have been obtained from published records. C—Average birds-per-hour for the Starling during 1937-1939. The concentration in a strip running northeast-southwest from New England to the Western Gulf Region is marked. Compare this with the first appearances as shown in map D. The figures for Missouri, Arkansas, Mississippi, and Alabama are probably low owing to the small number of reports. D—Average number of Starlings-per-hour for the initial year of appearance in the censuses. The high figure for Tennessee is undoubtedly the result of chance.

the timbered east. It is a general rule that birds and mammals wander more in 'marginal' than in optimum areas; this rule presumably applies to the Starling in its spread over new territory, for the prairie country, to all appearances, is more marginal than the timbered country. The Starling has certainly spread faster across the prairie.

In order to study the rate of spread on an area basis, I measured the amount of area enclosed by successive isopleths on the respective maps. These amounts (in square miles) are given in Table 2 and in Text-figure 2. The area has increased from zero in the year of



TEXT-FIG. 2. *Upper*—The spread of the Starling by five-year intervals. *Middle*—Total area covered by the Starling. *Lower*—Percentage of increase in the total area covered. (The solid lines are for published reports; the broken lines are for the census reports.)

establishment (assumed to have been 1895) to more than two and a half million square miles in 1940. The difference between the figures for the published reports and the census accounts is 464,904 square miles or 15.60%. The isopleths of Canada have been drawn farther north for the published accounts because of reports of stragglers in Labrador, Moose Factory, and Churchill; 200,000 square miles have been included by this. The published accounts indicate 171,261 square miles more territory covered in the West than do the censuses.

The unexplained difference between the two sets of figures is 93,643 square miles or 3.14%—a difference that is negligible indeed. If we split the difference between our respective results, we shall have a total of 2,717,161 square miles, a figure which is probably the best we can obtain at the present time.¹

That the census and published reports were not always so near to each other is clearly shown by Table 2. The difference was marked

TABLE 2

SPREAD OF THE STARLING AND ENGLISH SPARROW DURING SUCCESSIVE PENTADS AFTER THE RESPECTIVE INTRODUCTIONS. THE DATA HAVE BEEN OBTAINED BY MEASURING THE AREAS BOUNDED BY SUCCESSIVE ISOPLETHS.

Years after introduction	Starling						
	Actual years	Published accounts			Christmas census reports		
		Area of pentad	Area to date	Percentage of increase	Area of pentad	Area to date	Percentage of increase
1-5	1891-95	—	—	—	—	—	—
6-10	1896-00	—	(500)	—	—	(500)	—
11-15	1901-05	(15,624)	16,124	—	(5,513)	6,013	—
16-20	1906-10	34,553	50,677	214.30	9,020	15,033	150.01
21-25	1911-15	76,016	126,693	150.00	23,053	38,086	153.35
26-30	1916-20	476,830	603,523	376.37	135,308	173,394	355.27
31-35	1921-25	621,953	1,225,476	103.05	331,753	505,147	191.33
36-40	1926-30	361,654	1,587,130	29.51	472,071	977,218	93.45
41-45	1931-35	747,495	2,334,625	47.10	582,322	1,559,540	59.59
46-50	1936-40	584,988	2,919,613	27.63	955,169	2,514,709	61.25

Years after introduction	English Sparrow			
	Actual years	Area of pentad	Area to date	Percentage of increase
1-5	1854-58	—	—	—
6-10	1859-63	—	(300)	—
11-15	1864-68	(11,217)	11,517	—
16-20	1869-73	226,897	238,414	1970.11
21-25	1874-78	400,814	639,224	168.12
26-30	1879-83	679,535	1,318,763	106.31
31-35	1884-88	1,304,950	2,623,713	98.95
36-40	1889-93	—	—	—
41-45	1894-98	—	—	—
46-50	1899-03	—	(3,676,427)	—

¹ The Starling has been reported from eastern California (Condor, 44: 79, 1942) since this paper was sent to the Editor.

until the most recent pentad (1936-40). Although the difference may be the result of observational errors, it seems more likely that it reflects the difference between the progress of the *population front* and that of the pioneers that make up the *advancing front*. This is corroborated to some extent by the fact that the population front has overtaken the pioneer front only since the latter reached the non-forested country of the Midwest.

It has been stated in literature, principally on the basis of European authorities, that altitude governs the Starling and that it is a bird of lowlands. The altitudes of settled parts of Europe are low, mostly less than 2,000 feet. In contrast, the Great Plains of America rise to 7,000 feet at the continental divide, and much of this region exceeds 5,000 feet. Although the Starling doubtlessly spreads fastest through valleys, yet this can hardly be cited as an example of altitudinal influence, for the Starling follows settlement, and settlements are associated with valleys. The Starlings reported recently from Jackson, Wyoming, are already at 6,200 feet altitude.

The future spread of the Starling will doubtlessly continue, but it will probably be less rapid than the previous spread because of the mountainous terrain ahead, as well as the dry lands of the Southwest. The indications are clear that the Starling, like the sparrow, follows towns in its spread. This being so, the advance through the Rockies is likely to be through the passes which contain towns and farms. The belief that the sparrow was spread to some extent by riding in railroad cars hardly seems justifiable as an assumption for the Starling.

It is rather difficult to work out a satisfactory record of the spread of the English Sparrow (*Passer domesticus*), the other successful avian alien. The formal literature is singularly devoid of records of first arrivals of the sparrow, and the best study still is Barrows's monograph.¹ Today it is difficult to judge conditions as they were in 1883-1886 when Barrows gathered his data. Curiously enough, it is difficult to understand Barrows's interpretation of his own data; his writings do not explain how he reached many of his conclusions. It is probable that the many cases of transporting birds to locations ahead of the advancing front was the complicating factor. The data of Text-figure 1B prior to 1883 have been taken from Barrows's monograph with such supplements as subsequent reports indicate are necessary. The spread since 1883 has been obtained directly from available literature (though I must confess that data are rather

¹ Barrows, Walter B. 'The English Sparrow in America.' U. S. Dept. Agr., Division of Economic Ornithology and Mammalogy, Bull. No. 1, 1889.

meager). The mapping of the sparrow spread, like the mapping of the Starling spread, ignores all but the major trends.

We can assume from the data that forty years after its *introduction*, the sparrow had completed its conquest of America. Many areas were not completely overrun until later (such as southern California which was not overrun until after 1900), but the major outline of the sparrow range was substantially settled by 1893.

The spread of the sparrow, pentad by pentad, is given in Table 2 (area based upon the map), columns nine to twelve. It is obvious that the spread of the sparrow was much faster, pentad for pentad, than the spread of the Starling. The increase of the sparrow spread over the Starling spread for comparable pentads is given in Table 3.

TABLE 3

INCREASE OF THE AREA COVERED BY THE ENGLISH SPARROW IN COMPARISON WITH THE STARLING DURING COMPARABLE PENTADS. THE STARLING FIGURES USED ARE BASED UPON PUBLISHED REPORTS RATHER THAN THE CENSUS DATA.

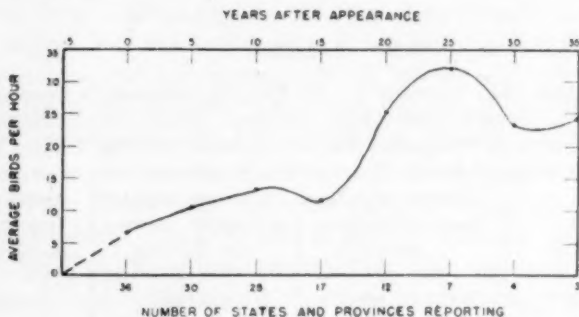
<i>Years after introduction</i>	<i>Sparrow area in excess of Starling area</i>	<i>Percentage increase of English Sparrow over Starling</i>	<i>Percentage of the sparrow range covered by Starling</i>
6-10	(-200)	-40.00	(-166.67)
11-15	-4,607	-28.57	140.00
16-20	187,737	370.46	21.26
21-25	512,535	404.55	19.81
26-30	715,240	118.51	45.76
31-35	1,398,237	114.10	46.70
36-40	—	—	—
41-45	—	—	—
46-50	756,814	25.92	79.41

Included also is the percentage of increase in the area covered by the sparrow and the percentage of the sparrow area covered by the Starling during the same pentad. The indication that the Starling spread faster in the initial years—in other words, became established more quickly—is probably not true. The accounts of the Starling's spread are more abundant than those for the sparrow, and they are not complicated by the transportation of birds ahead of the advancing front. Although a large portion of these transplants probably failed, nevertheless they throw doubt upon later data because it is not possible to tell whether many subsequent reports indicate the advancing front or transplants.

It would seem probable that the area covered by the 1859-63 pentad

was about a thousand square miles and the area covered during the following pentad nearly 35,000 square miles. We cannot tell from the present data, however, whether or not this is true though the evidence for it is strong.

Some very interesting things appear when attention is turned to the increase in numbers of the Starling as the years have gone by, but it must be remembered, of course, that the significance of the data may be lost when we come to specific details. Among the reasons for this should be mentioned the tendency of the starling to concentrate in winter (when the censuses were taken) near areas of human occupation, especially near cities and towns. Another reason is that



TEXT-FIG. 3.—The general increase in the abundance of the Starling (birds per hour of censusing) at five-year intervals after the first appearance in the censuses. The data have been averaged for all states and provinces.

the Starling migrates, and the migration, though real, is best considered as haphazard in comparison with the relatively well-ordered migration of native birds. We must not forget, too, that in recent years the mobility of the census takers has been increased by automobiles and good roads; thus more territory is now accessible.

The data for the censuses of each state or province have been combined to obtain a state figure of the average number of birds per hour of censusing for each year. The birds per hour for each state have been combined at five-year intervals after the first appearance in the respective states and provinces (Table 4 and Text-figure 3). The data are not complete for all areas and the reports as given by the censuses may not necessarily indicate the true first year of appearance; yet this does not appear sufficient to disqualify the data for study of general or mass trends. The general increase (the table is actually a table of general increase without regard to area) rises slowly for

TABLE 4
INCREASE OF THE STARLING POPULATION DURING SUCCESSIVE YEARS AFTER ITS
APPEARANCE IN EACH STATE OR PROVINCE

<i>Years after its appearance</i>	0	5	10	15	20	25	30	35	40
<i>Number reporting</i>	46	37	29	19	13	7	4	3	
<i>Number of areas for which data are available</i>	35	30	25	17	12	7	4	3	(1)
<i>Average birds per hour of censusing</i>	6.72	10.52	13.11	11.56	25.32	32.04	23.55	24.11	(42.47)

the first fourteen years followed by a sudden rise and fall. The rise of the 20-25 year period and the subsequent fall may be real or induced by the data, which are fewer for advanced years.

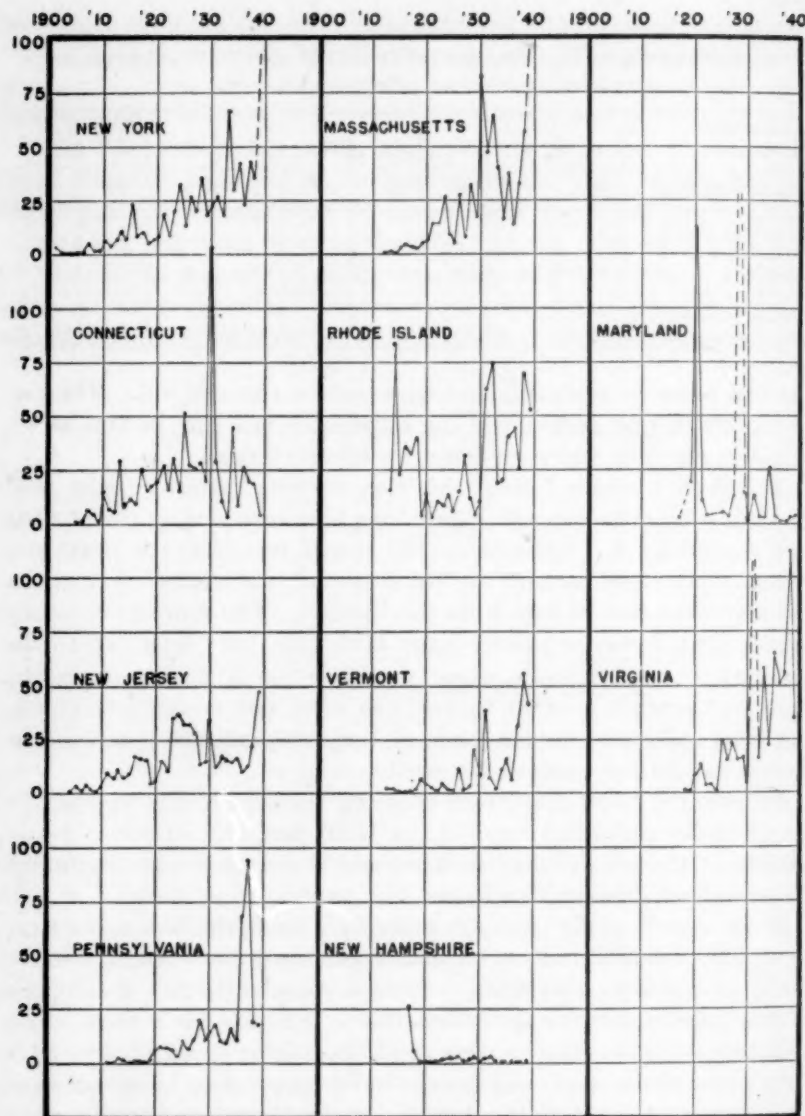
The decline which follows this rise, however, agrees in part with the data from the states which have long been occupied by the Starling (see Text-figure 4). Inasmuch as the North, especially the Northeast, is best represented beyond the third pentad, the decline may reflect the preponderance of data from this locality. The sudden rise of the fourth pentad may represent many birds that have migrated to the southern states. Actually, these would be birds missing from the sixth and seventh pentads because the sixth and seventh are chiefly northern and northeastern birds of the same calendar years as the fourth and fifth pentads of the south.

Because the Christmas-census data lag behind the first appearance (as given by published reports), we shall probably obtain a better picture of the steady increase if we add a pentad to the beginning. This has been done in Text-figure 3.

If we are to make any generalizations from the first-appearance figures, it would be that the first appearance is by small flocks,—flocks of less than fifty birds. In fact, more than half the reports of first appearances are for groups of less than five birds each, which probably indicates that the first appearance is by stragglers.

In order to see if any similarities of the population curve occurred in all areas, I graphed the figures for the birds per hour in those states where the Starling has been established longer than twenty years (Text-figure 4). Because we are dealing with observational data—and rough data at that—there are many minor differences in the curves as well as occasional 'surges,' the latter probably caused by chance.

The ten curves of Text-figure 4, however, follow the same general



TEXT-FIG. 4.—Starling increase (birds per hour) in ten states where the species has been established for twenty or more years and for which the census records are complete for each year or nearly so. The broken lines indicate surges too large for the scale of the graph.

trend: the rise of the first ten to fifteen years is gradual; then follows a rather sharp rise for a few years more; the rate of rise begins to slow up somewhere in the neighborhood of the twentieth year; and it is thereupon followed in the 25-30 year period by indications of approaching stabilization. The first appearance of Starlings in the census reports, it must be remembered, lag behind the advancing front by about five years. If we add five years to the approximations just given, we shall probably have a true picture of the increase in population from the time of first appearance.

Despite the plausible appearance of the data, we must not overlook the very real possibility that the Starling may not yet have reached its maximum abundance even where it has occupied an area for half a century. Kalmbach expressed the belief in 1928 that the maximum was reached in fifteen to twenty years in established areas.¹ This may be true of the breeding season, but the data for Christmas birds—that is, wintering birds—(hence, the whole year), indicate that, instead of leveling off, the increase rate is several years from the level point and has only begun to slow up, if it is slowing up at all; it cannot be said to be stable. The difference in opinions is probably due to the fact that this study deals with mass data from filled and unfilled ranges, whereas the data used by Kalmbach dealt, for the most part, with birds in filled range. In a regional study, the filling of unoccupied range would be shown as a population increase whereas a local study would deal only with a small part of the range, and the earlier stabilization could be clearly indicated.

In order to study the data for indications of present distribution, I averaged the data for the years 1937, 1938, and 1939. These data are mapped in Text-figure 1C. They show a clear concentration in the strip between the western Gulf states and New England. Whether this is a true picture of winter concentration remains to be seen when more data are available, but it agrees with the concept of a north-east-southwest migration. The concentration areas within this strip appear to be areas of cities and towns, and farm lands.

A map of the data for the average birds per hour in the year of first appearance (Text-figure 1D) reveals the same strip of territory wherein the Starling shows a concentration. Indeed, the map shows a more pronounced concentration in the lower Mississippi Valley and western Gulf region for the first year than for the present time.

It hardly seems possible to estimate very adequately the Starling population of the country on the basis of present data. Nevertheless,

¹ Kalmbach, E. R. 'The European Starling in the United States.' U. S. Dept. Agr., Farmers' Bulletin No. 1571, 1928.

the data of *individual stations* for 1939, when adjusted by removal of fifteen extraordinarily large flock groups totaling 147,713 birds, averaged 5.93 birds seen for each mile of travel. By assuming that the observers spotted birds for forty rods each side of the census path, we arrive at the figure of one-fourth square mile of area covered by each mile of travel, or 23.72 birds to the square mile. This would indicate a Starling population of 64,451,059. On the basis of the *combined totals* for all stations, the 1939 averages of birds per mile and square mile are 7.24 and 28.96 respectively, or 78,688,983 birds. If we again split the difference between the two methods, we arrive at a figure of 71,570,021 Starlings in this country. Were we to study the data closely enough to allow for uninhabited areas, the total would probably not exceed 50,000,000. Similar treatment of the data for the English Sparrow gives an estimate of 205,769,619 birds, and were we to allow likewise for uninhabited range, the figure would probably not exceed 150,000,000. These figures are in sharp contrast to statements in literature that these species are present "by the billions."

My figures for the total bird population of the United States is 5,660,000,000 for the breeding birds and 3,776,000,000 for the wintering population. Although the Starling and English Sparrow figures are not for a comparable area, it would appear that they constitute not more than 1.00% and 3.00% respectively of the breeding population, and 1.50% and 4.50% of the wintering population of the United States. It seems likely, however, that further study will reduce this figure.

SUMMARY

The Starling data of the forty years of Bird-Lore Christmas-censuses have been tabulated and used in this study. In addition, reports of first arrivals have been sought in the literature.

Only the broader and more general aspects of spread and abundance have been considered.

The appearance of the Starling in the census reports averages five years later than the reports in the literature.

The Starling is not limited by low altitudes but has reached areas more than 6,000 feet above sea level.

The spread has been more rapid through the southern and south-central states than in the north.

The rate of spread, as measured by percentage of area covered, was fastest in the 26-30 years (1916-1920) after its introduction.

The area covered by 1940 is calculated as 2,717,161 square miles for

the Starling which is still spreading. For the English Sparrow, the area is calculated as 3,676,427 square miles.

The English Sparrow spread much faster than the Starling, and its occupation was substantially completed forty years after its introduction. The Starling spread is still far from finished fifty years after its introduction. Presumably it will occupy the same territory as the sparrow.

The first appearance of the Starling in a new area is usually by small flocks of winter stragglers. The flocks generally are less than five birds in size. The establishment of the species as a breeding bird tends to lag behind the first appearance by about five years.

The increase of the population is gradual for the first ten to fifteen years after the appearance of the bird in a locality. Then comes a sharp rise for a few years which is followed by a slowing up of the increase rate and signs of approaching stabilization by the twenty-fifth to thirtieth year.

The census data for the 1937-1939 years, as well as the first year of appearance, show a concentration in a strip from New England to the western Gulf region.

The number of Starlings and English Sparrows is estimated to be not more than 50,000,000 and 150,000,000, respectively. They constitute about 1.00% and 3.00% of the breeding bird population, and about 1.50% and 4.50%, respectively, of the wintering bird population.

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GENERAL NOTES

Remarks on *Phasianus Crawfordii* and other birds named by J. E. Gray from Crawford's 'Indian drawings.'—"*Phasianus Crawfordii*" was described by J. E. Gray in Griffith's Cuvier, 'The Animal Kingdom,' 8 [The Class *Aves*, vol. 3]: 27, 1829, with type locality Ava, but without designation of type specimen or drawing.

Gould (The Birds of Asia, pt. 12: text opposite pl. 21, 1860), mentions that "on inspecting the large collection of drawings at the East India House, I noticed one of a bird I had never seen, and which was said to have been made by Finlayson in Siam, forty years ago." Gould reproduced the drawing on col. pl. 21, believing it to represent the still unknown female of *Diardigallus praelatus* Bonaparte [= *Diardigallus diardi*], and observed that if his surmise proved to be correct, the name *crawfordii* must be employed for Diard's fire-back. Since "*Phasianus Crawfordii*" was known to science only through Gray's diagnosis, one is forced to believe that Gould had some good reason for considering that he had before him the basis of Gray's description. It is devoutly to be hoped that this and other zoological drawings in the archives of India House will be available for examination at the conclusion of the War.

With the later discovery of the true female of *D. diardi*, Gray's name was discarded by authors, largely because of the careless wording of his description, which made it virtually impossible to attach the name to any known pheasant, least of all to any form known from Ava.

A comparison, however, of Gray's description with the Finlayson drawing reproduced by Gould shows no disagreement between the two except for the statement "wing-coverts, white," whereas, in the drawing, they are uniformly brown. Since the two match in every other particular, this discrepancy can be explained as a simple *lapsus calami*. Gray's observation that the length of *crawfordii* is fourteen inches is, of course, senseless as applied to a pheasant, but may refer to the length of the pictured bird.

Crawford's 'Indian drawings,' upon which Gray erected several avian names, are all, apparently, the drawings (of birds and mammals) made during Crawford's journey to Siam and Cochin-China under the direction of George Finlayson, surgeon-naturalist of the party; they were later deposited, some at East-India House, others at the Museum of the East-India Company in Calcutta. The various forms were described by Gray after Finlayson's untimely death and the type locality of three of them was said to be Ava, for no other reason than that Crawford once resided there.

Two of these birds, "*Turdus Avenis*" [= *Geokichla interpres interpres*] and "*Picus Crawfordii*" [= *Dryocopus javensis javensis*] are Malaysian forms, unknown in Burma; the type locality for both is here corrected to Malacca, where, says Finlayson (The Mission to Siam and Hué: 41, 1826), "we procured a considerable number of birds. They were chiefly brought for sale by the Malay inhabitants."

In the case of "*Phasianus Crawfordii*," we have the authority of Crawford himself (Journal of an Embassy from the Governor-general of India to the Courts of Siam and Cochin China: 433, 1828), that the party ascertained to exist in Siam "a new species of fire-backed pheasant . . .," I think there can be little doubt that the drawing seen by Gould represents the bird referred to by Crawford; the error in generic identity made by a diplomat is pardonable enough when we consider that

¹ Published with permission of the Secretary of the Smithsonian Institution.

Could himself mistook it for a fireback. In the same paragraph we find: "I do not know whether Siam itself, or the provinces lying north and east of it, produce any pheasant except the fire pheasant already mentioned; but its Malayan tributaries produce the common fire pheasant . . ." and in a footnote he adds that a live specimen of the latter was carried back from Prince of Wales's Island (Penang) to Barrackpore.

After showing that Finlayson's drawing may be considered the type of "*Phasianus Crawfordii*" and that it was made from a Thai example, it remains to decide to which Thai species the name is applicable. Comparison of the picture with all the pheasants occurring in Thailand proves that it can represent only a female of the species commonly called *Gennaues lineatus* and the reddish feet further limit it to the race "*sharpii*."

Since the only mainland locality in Thailand visited by the Mission was Bangkok and its neighborhood, where no pheasant is found in the wild state, we may be sure that the bird was a captive. Its possible provenance nearest Bangkok is southwestern Thailand, and I now designate as corrected type locality of *Gennaues crawfurdi crawfurdi* (J. E. Gray), Hat Sa:nuk, near Praec:chuap Khirikhan (Ko: Lak), S. W. Thailand, a place lying at the periphery of the species's range and where, despite published records to the contrary, only typical *crawfurdi* ("*sharpii*") seems to have been taken. I place under this name also the specimens from the Sam Roi Yot district, S. W. Thailand, reported as "*lineatus*" by Riley (U. S. Nat. Mus. Bull. 172: 67, 1938).

While on the subject of Finlayson's drawings, it may be well to mention the three forms "discovered and drawn by John Crawford, Esq., at Siam," and described by Gray in The Zoölogical Miscellany, no. 1: 3, col. pl. 2, 1, 3, 1831. They and "*Phaenicophaeus Crawfordii*" [= *Rhopodytes sumatranus*], *Coccyzus badius* [= *Rhinortha chlorophaea*], and "*Bucco trimaculatus*" [= *Cyanops australis duvaucelii*]. All are forms of the Malay Peninsula, and the last does not even occur within the borders of Thailand (as of 1939). Since no locality in Peninsular Thailand was visited by the Mission, the type locality for all three is here corrected to Malacca.—H. G. DEIGNAN, U. S. National Museum, Washington, D. C.

An old record for Celebes revived.—Among the many mysterious species of Brüggemann (Abhandl. vom naturwissen. Ver. zu Bremen, 5: 75, 1876), some of which were later disqualified by Blasius (Journ. für Ornith., 31: 151, 1883), was *Corvus annectens* supposedly collected on Celebes. Blasius called the type, the sole specimen, *C. macrorhynchus* (tom. cit.: 159). In his review of the genus *Corvus* (Novit. Zool., 33: 85, 1926), Meinertzhagen lists this bird under *Corvus coronoides orru* with the following note: "Type in Darmstadt Museum, wing 326 mm. Obtained at Gorontalo (Schneider), in Celebes. . . . The record from Celebes is probably an error." Stresemann [Ibis. (13) 6: 368, 1936] says: "None of the three crows described by Brüggemann, and believed to have been collected in Celebes, are natives of this island."

A specimen in the collection of the United States National Museum (No. 146,921 collected by "Fricke" at Menado, and received from the Museum Boucard) seems to belong to the race *orru*. It is a mature bird in worn plumage, not sexed, and measures: wing, 304 mm.; tail, 151.5; culmen, 56.5; height of bill at base, 25. The bird has the violet sheen associated with *orru*, and though small is not outside of the range given by Meinertzhagen (tom. cit.: 85).

As Gorontalo is also on the northern Menado peninsula of Celebes, I think this

second record tends to validate Brüggemann's specimen and locality. Thus *C. m. orru* must be presumed to occur in north Celebes. Why it should be so rare in that well-worked locality is an interesting question. Perhaps the strong competition of *C. enca celebensis* is the answer, or perhaps it is merely a straggler to the island from the western Moluccas.—S. DILLON RIPLEY, *U. S. National Museum, Washington, D. C.*

Seasonal changes in color of the gape of male Purple Finches.—I have looked through many bird books and have yet to find any comment on the changes in color of the skin of the gape in male Purple Finches. I have many Purple Finches here in spring, summer, and fall; and a few now and then in winter, and have banded many thousands; consequently I have been able to check the color at all seasons.

In winter the skin of the gape is dull brownish. It then gradually brightens and becomes yellowish, later changing to orange. The orange gradually reddens until, shortly before molting time, the skin is quite bright red-orange and in some cases becomes a bright blood-red. After the molting season the color gradually works back until, late in November or early December, it is back to the dull brownish of winter. Crimson males are not so bright in the fall as in the following spring. The reason is that the new feathers after molting have whitish barbules but, by wear, these are mostly removed by spring and consequently the reddish color of the feathers looks much brighter. If any reddish feathers are lost and new ones replace them, the new ones will not be red if at the time of growth of the new feathers there was no red showing in the skin of the gape. I believe this is the reason that so many crimson males are found in the spring showing a few yellowish-brown or olive-brown feathers. By checking the color of the skin of the gape you can tell how bright the birds will be in the spring. The first sign that a brownish bird is a young male of the previous year and not a female is the appearance of red in the skin of the gape.—M. J. MAGEE, 603 South St., Sault Ste. Marie, Michigan.

Starlings and woodpeckers.—Presumably a search through the literature would disclose many specific instances of damage by Starlings to our native bird population, but I do not recall having noted much more than casual reference to it. How serious a competitor is the Starling, to just which of our birds in different sections, and what are its methods?

Starlings are, of course, abundant at all times of the year in the suburbs of Baltimore, where I live. In food habits they are highly beneficial to me personally. In pairs they search the lawns for cutworms, and in flocks they deploy through the longer grass of the meadow, to my advantage. I raise nothing that they damage.

Close to my house are two large silver maples with dying stubs, handy for observation from living room, dining room, bed room and bath. In one or the other of these trees a pair of Flickers has endeavored to nest for the last five years, and a pair of Downy Woodpeckers for three. The usual procedure is for the Flickers to start an excavation at a height of some 30 feet, but before the hole is completed a pair of Starlings is often to be seen, early in the morning, on nearby twigs. When the nest is finished one of the Starlings enters the hole and remains more or less continuously. A Flicker will enter and after a space from a few seconds to a minute or more, emerge with the Starling clinging to it. The Flicker endeavors to fly off, but flutters half way to the ground before both birds

separate. Sometimes the Flickers give up easily, or again they will persevere for several days, but always the result is the same.

There are two natural cavities in one of these trees, but the Starlings prefer the nice new holes of the Flickers. One year Starlings nested in one of these natural cavities (often tenanted by a Screech Owl), occupied another year by a pair of red squirrels. During tenancy by the latter, the Flickers nested in the second cavity, which is too low to interest Starlings, anyway. The squirrels did not fancy such near neighbors, entered the nest, killed the male Flicker and dumped him out of the hole. The female had a new mate within two days, but before long the eggs were deserted.

Last year the Starlings did not molest the Flickers until the eggs were laid. I was reading in the living room when a Starling alighted on a pine branch nearby and dropped something white. Investigation disclosed that the bird was removing Flicker eggs, one at a time, and dropping them to the ground. I shot the Starling before all the eggs had been destroyed, but within a few days the stub blew down, breaking cleanly at the nesting cavity, and nothing more was seen of the Flickers.

These occurrences, however, do not show the Starling in its most diabolical rôle. The Downy Woodpeckers nest high in the most frequently tenanted of these two trees. They are quiet and exemplary neighbors, and the holes are so small that I am not certain that a Starling could even wedge its head into one. Nevertheless it is doubtful whether the downies have been permitted to rear a brood in the three years concerned. They are ignored by the Starlings until the young of the former are of respectable size. Then we are made aware, by an increasing tempo of outcries early in the morning, that the downies are greatly perturbed. The Starlings are close to the nests, hopping from twig to twig and peering in the hole. This continues, with increasing aggressiveness, for several mornings, but I have witnessed the climax only once. A Starling with something in its beak approached the hole and appeared to dangle it temptingly at the entrance for a moment, before giving a single mighty jab. This was repeated several times. Evidently it was trying to entice, with bait, a young downy within reach of a crippling blow by its beak.

The elimination of Downy Woodpeckers from the vicinity of Starling nests can be of no possible benefit to the latter. But the Starling is an aggressive and singularly successful type. In the latter rôle it is doubtless impatient of near neighbors of all sorts. The trait will prove to be hard on some of our native birds, and may likely prove critical for some of our woodpeckers.—A. BRAZIER HOWELL, *Department of Anatomy, Johns Hopkins University, Baltimore, Maryland.*

Nesting of the Eastern Bluebird.—For the past ten years, Bluebirds (*Sialia sialis*) have been attracted to boxes expressly placed for them about my home at Ithaca, New York. These boxes were so designed that the top could be removed easily, thus facilitating a study of nest construction, eggs and development of the young. Since few attempts have been made to record the domestic activities of this species, and published observations are notable only for their paucity, it appears justifiable to record my notes.

Bluebirds usually arrive in central and western New York during late February or the first week of March. It seems likely that these are birds which are to pass the breeding months farther north, for, following their arrival and early departure,

usually a week, more often two weeks, will pass before resident birds become abundant about their nesting haunts.

Nest Building.—Once the resident birds have arrived, little time is lost in selecting a nesting site. If a box or tree cavity meets with their approval, preliminary nesting activity commences at once, as if to establish ownership. During the spring of 1931, a pair of Bluebirds arrived in my yard on March 27. I first saw them inspecting a bird box at 6 a. m. At 6:30 a. m., both were carrying in straws and grasses. The weather remained cold, freezing temperatures prevailing daily, and no further work other than this initial structure was attempted until April 3. Two pairs of birds commenced nest building on April 7, 1929; in 1932 a pair started building activities on April 16. Usually cold or otherwise inclement weather interrupts these building operations. I have noticed that the male is generally the more industrious worker during the incipient stages of nest construction; the female is usually entrusted with the lining and final completion of the structure. Nest building may occupy three weeks, but the entire structure can be completed in five days or possibly less.

During nest building, the male courts the female daily. Courtship consists of wing-quivering not unlike that exhibited by young birds begging for food. The humerus is held close to the body, and the primaries are rapidly waved, occasionally almost at right angles to the body. The familiar warble accompanies this act.

Incubation.—As soon as the nest is completed, the eggs are laid, one daily until the complement of four to six is complete. I have observed that the eggs are usually laid about 8 a. m. This has been so in fourteen records where the nest chamber could readily be observed. No reason for this is apparent. Usually the bird does not commence to incubate immediately the clutch is complete, but a dozen hours or so elapse before incubation normally starts.

The loss in weight of the eggs occasioned by the evaporation of gases from within the shell during incubation is not great. Five sets of eggs were weighed daily from the commencement of incubation until the developing young were ready to pip the shell. The newly laid egg varies between 2.55 grams and 3.22 grams. The average weight of 24 eggs was 2.91 grams. At the close of incubation, just prior to pipping, the eggs have lost from 11.8 to 13.4 per cent of their original weight. The average weight-loss of 24 eggs during incubation was 12.62 per cent. The loss is a gradual one from the inception of the incubating period until its termination.

Burns [Wilson Bull., 27 (1): 286, 1915] lists the period of incubation as twelve days, both sexes participating. I have carefully watched a dozen pairs and have never observed any evidence of the male relieving the female. He is very solicitous of her welfare, and constantly brings her food or sings from a nearby perch, but no other family duties engage him until the young appear. In only one instance has the incubation been twelve days. I have eleven records of thirteen days, one of fourteen days, and another of seventeen days. This last record, of an exceptionally long period of incubation, may be attributed to *Polistes* wasps which had constructed a nest on the ceiling of the box and apparently irritated the bird in some manner. In addition, unseasonably cold weather prevailed during this incubation period, and the female appeared to spend uncommonly long intervals away from her eggs. Daily removal of the eggs for a few minutes from the nest box to weigh them apparently had little effect on the incubation period, for those sets which were not weighed required a similar period for hatching.

On April 24, 1929, two Cowbird eggs were deposited in a Bluebird's nest which had just been completed. Both were curiously marked, pencilled on the larger end like the egg of a Red-wing. The female Bluebird promptly covered these with a new lining.

The eggs, even though in an advanced stage of incubation, can withstand desertion for many hours. At 11 a. m. on May 11, 1938, a cat caught a female Bluebird which had left her incubating duties momentarily to feed on the ground. This occurred on the ninth day of incubation. At 5 p. m. the eggs were cold. The following day was unseasonably cold, with temperatures of 34° to 40° F. prevailing. Although several people kept watch throughout the day there was no sign of the male about. At noon of the following day (May 13) the male appeared with another mate, a much paler bird than his previous consort. This female immediately took over incubating duties. In spite of chilling temperatures and an interruption of incubation for 49 hours, four of the eggs hatched on May 16, fourteen days after incubation had commenced. The remaining two did not hatch.

The first set of eggs usually numbers five or six; in twenty-two first sets examined one contained four, fifteen contained five and six contained six. The second set usually consists of four eggs; occasionally three and less often five are laid.

Development and care of young.—Newly hatched Bluebirds are blind, nearly naked creatures which exhibit the feeding reflex in a few hours. They grow rapidly and usually leave the nest on the fourteenth to sixteenth day, although a slightly longer period is required for some fledglings to try their wings. The feather tracts first appear on the fourth day; the last to appear is the femoral tract. The feathers of the ventral and flank tracts and the secondaries erupt on the eighth day. On the ninth day the eyes first open. The primaries have a definite blue color, while the belly and breast-feathers are distinctly white. Occasionally this condition may not prevail until the eleventh day. When the birds are twelve days old, the breast-streaking characteristic of the immature bird is evident. At this age the nestlings crowd to the nest entrance and clamor for food, giving the characteristic chirruping note so common to the family. From

DAILY WEIGHT INCREASE IN GRAMS OF BLUEBIRD NESTLINGS

Days	Brood 1 (5)*	Brood 2 (5)	Brood 3 (4)	Broods 1, 2, 3 (14)	Daily percent gain or loss
Hatching	3.15	3.2	2.7	3	
1	5	5.1	4.15	4.75	+58.4
2	6.7	4.65	6	5.78	+21.7
3	8.7	6.4	8.6	7.9	+19.4
4	12.4	9.6	12.1	11.4	+44.3
5	15.3	13.1	14.1	14.2	+24.6
6	19.4	17	16.9	17.8	+24.4
7	21.6	20.5	19.5	20.5	+15.3
8	23.5	23	22.5	23	+13.7
9	24	25.1	23.5	24.2	+ 5.2
10	25.7	25.4	26	25.7	+ 6.2
11	26.9	27.1	26.7	26.9	+ 4.3
12	26.7	27	26.3	26.7	- 1.5
13	27.2	27	26.3	26.9	+ .75
14	27	28	26.4	27.2	+ 1.1
(all left nest)					

* Figures in parenthesis indicate number of nestlings weighed.

this period to the time they leave the nest, the youngsters call incessantly from dawn to dusk, occasionally giving lusty cries long after it has become too dark for the parents to gather food.

I saw one brood voluntarily leave the nest box on the sixteenth day after some coaxing by the parents. The largest nestling on its initial flight from the box flew 70 yards. Three others flew to a clothesline 10 yards away, but the smallest missed the line, volplaning to the ground 30 yards from the nest.

The parents commence to feed the first young to hatch, and as the interval between hatching of the entire clutch may be twelve hours or longer, it is evident that the most precocious youngsters secure a good start over their less fortunate nest mates. When the birds are small, about 60 to 90 trips a day suffice, but with increasing size and greater alimental needs, the parents must 'hustle' from dawn to dusk. During a three-hour period (5 a. m.-8 a. m.) the adults made 47 trips to the nest and later on the same day (4 p. m.-8 p. m.) 61 trips were recorded. cursory observation during midday did not suggest that feeding was curtailed in any way. On this basis we may assume an average of 225 trips a day.

As soon as the first brood has left, the female commences relining the nest, and within a few days has started incubating her second clutch. Meanwhile, the male is caring for the young birds. They seldom venture far from the home site, and may almost invariably be seen within a quarter mile or so of it. When the second brood has hatched, and this may be late July or early August in the event of a late first nesting, the male parent returns and aids in the feeding. Occasionally feeding duties are rendered less arduous by the young of the first brood aiding in these duties.

Nesting Bluebirds which I have observed are seldom concerned over the proximity of other native birds, but I have seen the male vigorously pursue Baltimore Orioles on several occasions, chasing them for two hundred yards or more. On one occasion the male threw two eggs of a Chipping Sparrow from a nest in a nearby plum tree.—W. J. HAMILTON, JR., *Cornell University, Ithaca, New York.*

Unusual nest of the Parula Warbler.—What I am inclined to believe is the first nesting record of the Parula Warbler in this immediate vicinity was secured this month. I discovered the nest along the Chemung River about two miles west of this city on June 10. The nest had been built within a cone of grasses, weed stalks and leaves that had been caught on one of the slender lower branches of a maple tree overhanging the river when it was in flood. The receding waters had left this particular cone about nine feet above the present sloping bank. Lacking the customary *usnea*, the Parulas had utilized fine rootlets, grass fibers, bits of linty material, and the like for the nest itself.

When discovered, the young had already hatched. On June 16 they left the nest. My husband and I subsequently collected the nest, at the suggestion of Dr. Arthur A. Allen of Cornell University, who in the meantime had been notified and on June 12 came and filmed both nest and parent birds. For the Parula to build this type of nest appears so exceptional as to deserve special mention.—OLIVE R. YORK, *862 Hoffman Street, Elmira, New York.*

Bullock's Oriole as a fighter.—While serving as a member of a biological collecting party in southeastern Utah during June and July of 1927, the writer had an opportunity to observe some interesting and unusual activities of Bullock's

Oriole (*Icterus bullocki*) nesting at Green River City, Utah. In this locality the orioles were quite numerous and were in the midst of their nesting season.

Magpies (*Pica pica hudsonia*) also were very common. One of these omnivorous feeders, a juvenile about one-half to two-thirds grown, was observed circling about an oriole's nest as though searching for a breakfast of eggs. The Magpie soon alighted in the tree in which the nest was hanging and began to come closer and closer to the beautiful swinging structure. Almost at the instant the Magpie settled upon the edge of the nest, the male oriole, which apparently was but a few rods away, was heard to give an abrupt and angry call of warning. A moment later the enraged male came with all his force at the intruder, striking it on the crown of the head. The Magpie dropped to the ground, stunned to such an extent that the writer was able to pick it up, and only after ten minutes could it regain sufficient strength to fly away.—CLARENCE COTTAM, *Fish and Wildlife Service, Washington, D. C.*

Bass eats Yellowthroat, young Stilts, and young Ducks.—While fishing on Lake Okeechobee, Florida, in October, 1942, our party caught a three-pound largemouth bass (*Huro salmoides*) that had the remains of a Yellowthroat (*Geothlypis trichas*) in its stomach. This fish struck savagely from under a clump of water hyacinth at a surface lure, and it is easy to imagine how it could catch a Yellowthroat, fluttering over the water to pick up floating insects, as I've seen them do in a similar manner.

Mr. Marvin Chandler of Okeechobee City tells me that some years ago he saw bass take downy young Stilts (*Himantopus mexicanus*) that had been frightened into the waters of Lake Okeechobee and were swimming there, and that he knew of eight of a brood of twelve downy young domestic ducks being eaten by bass in a single day on a tributary of Lake Istokpoga.—A. L. RAND, *Archbold Biological Station, Lake Placid, Florida.*

Turkey Vulture feeding habits.—On June 5, 1942, Elton J. Hansens and I flushed five Turkey Vultures (*Cathartes aura septentrionalis*) on the Cross Keys Road, about two miles east of Glassboro, New Jersey. Upon arriving where the birds had been we found the remains of the carapace and plastron of an eastern box turtle, *Terrapene carolina carolina*. These parts had been cleaned of most of the meat. The turtle had been killed that morning by an automobile and what meat was left appeared fresh and no apparent decomposition had set in as no odor was noticeable.

On June 17, 1942, Mr. Hansens and I flushed a Turkey Vulture on the Cross Keys Road about a mile east of Glassboro. We found that the bird had been attracted by a dead gray squirrel, *Sciurus carolinensis carolinensis*. The bird was flushed before it had a chance to start eating the squirrel. The squirrel was covered with greenbottle-flies (*Calliphoridae*), but there was no noticeable odor.

In both of these cases it is interesting to note that there was no odor which might attract the Vultures to these dead animals; also that in both cases they were interested in fairly fresh meat. This shows that odor may play little or no part in helping Turkey Vultures find their food.—WILLIAM F. RAPP, JR., *130 Washington Avenue, Chatham, New Jersey.*

Defensive behavior of the White-breasted Nuthatch.—On the morning of April 25, 1942, while conducting field observations on birds in Washington Park, Albany, New York, I witnessed a demonstration of the interesting defensive behavior of a

pair of White-breasted Nuthatches (*Sitta c. carolinensis*). Both birds were busily engaged in the construction of a nest in a knothole in a partially decayed limb about eighteen feet up in a soft maple tree. The male had just delivered to the female within the nest cavity a small amount of material that appeared to consist of the frayed vane of a delicate feather when the proceedings were interrupted by the presence of a prowling Northern Gray Squirrel (*Sciurus carolinensis leucotis*).

Slowly and somewhat hesitatingly the squirrel ascended the limb toward the nest but at once the male nuthatch uttered a low alarm note and forthwith fluffed out his body feathers to their full extent. Still the squirrel came on. Then the male nuthatch, with all the contour feathers elevated and spread, and the wings extended as completely as possible, began a steady, rhythmic, side-to-side swaying movement, the while advancing toward and retreating from the now irresolute squirrel. Neither the bird nor the squirrel uttered a sound audible to the observer a few feet away. Presently the female nuthatch emerged from the nest-opening and joined her mate in the feather-elevating and rhythmical swaying of her body.

Both nuthatches remained close together on the limb, the female more or less completely covering the opening to the nest-cavity with her body and extended wings. This performance was continued for three to four minutes. The sight of these two suddenly enlarged birds with contrasting black and white coloration, rapidly vibrating wings, and threatening demeanor brought the squirrel to an uncertain halt; then a well-directed peck from the still quivering male nuthatch prompted the intruder quickly to take his departure from the scene.

While the birds themselves may have been in no acute peril from the squirrel, their mutual assumption of this unique oscillating attitude, similar to that sometimes employed in mating performances, obviously was effective in discouraging the presence of a larger, unwanted animal, which threatened real or at least imaginary danger.—DAYTON STONER, *New York State Museum, Albany, New York.*

Canada Geese perching at Malheur Refuge.—On April 30, 1940, while locating and recording data on waterfowl nests in the southern part of the West Swamp field, in Unit 4 of the Malheur National Wildlife Refuge, Oregon, assisted by a crew of C.C.C. enrollees, the writer and the enrollees noted a Canada Goose (*Branta canadensis*) perched on top of a fence post at the south edge of the field. The bird was observed for some time at a distance of 100 yards. It was facing a fairly strong wind which did not seem to affect its perching ability. The post was measured after the bird was flushed, and was found to be 65 inches high, the roughly diamond-shaped top being 10 inches by 7 inches. A C.C.C. foreman reported seeing a similar occurrence, on two different occasions, in Unit 2 near the old P-Ranch buildings of the Malheur Refuge, about ten days previously. This was about six miles south of the Unit 4 observation, and in all probability was not the same bird.

The following year, on April 24, while locating Canada Goose and Sandhill Crane (*Grus canadensis tabida*) nests in the Unit 4-area mentioned above, the writer again observed a Canada Goose perched on a fence post. It appeared to be on the same post that the goose was noted using the previous year. There was no wind blowing that day. The goose remained on the post only a few minutes before flying away.

During the evening of April 27, 1942, at Malheur Refuge, another observation was made of a Canada Goose on top of an 18-foot telephone pole. When approached, the goose flew away and was accompanied by its mate. There is no way of determining whether this is the same goose as that noted perched on a fence post in 1940 and 1941. While Canada Geese are commonly seen perched on high rock ledges bordering portions of the Blitzen Valley of the Malheur Refuge, their perching on fence posts and telephone poles seems quite unusual.—CLARENCE A. SOOTER, *U. S. Fish and Wildlife Service, Burns, Oregon.*

Kingbird housekeeping.—We know that many birds are good housekeepers in that, after the young are hatched, they keep the nest scrupulously clean by removing the droppings. A pair of Kingbirds (*Tyrannus t. tyrannus*) have a nest in the spruce tree in the side yard of my country home in Vermont. In the front yard, enclosed by a picket fence with the grass carefully mowed, flower borders on all sides and a handsome bird bath, I like to serve tea to my friends; in fact, that part of the grounds has always been known as the 'Tea Garden.'

Now, what did these Kingbird parents do but use the bird bath as a depository for the nestlings' droppings? I watched one or the other come there, probably four or five times an hour, perch on the side of the bath and drop the excrement into the water. Occasionally the bird would take a sip or two of water before flying away, but not often. I cleaned out the bath every day and estimated that during each twenty-four hour period about fifty droppings accumulated.

Personally I had never heard of such a case before, nor had the bird friends with whom I discussed the incident. Later, however, another friend sent me a copy of an article by Edward C. Raney in 'The Auk' for January 1941, on 'Feeding and Disposition of Nestling Feces by the Kingbird.' In this case, however, the feces were deposited in a row on a boat dock as well as on the back seat of a rowboat fastened to the dock.—LILLIAN S. LOVELAND, *River Road, Norwich, Vermont.*

Predation upon Wilson's Phalarope by Treganza's Heron.—While driving from Boulder, Colorado, to Fort Collins on May 9, 1942, the writer observed a Treganza's Heron (*Ardea herodias treganzai*) standing a few feet from the shore of a roadside pond. Fifty feet beyond it eleven Wilson's Phalaropes (*Steganopus tricolor*) were swimming, one of them some distance from the others. Suddenly the heron flapped over the pond, alighted on the water and seized the lone phalarope by the neck. After shaking the smaller bird violently and plunging it beneath the water several times, the heron carried it to shore. There it dropped the phalarope on the ground, pecked it a number of times and again immersed it in the water. Finally, it tore the wings from the phalarope and rapidly swallowed the remainder of the carcass. Great Blue Herons are known to capture smaller birds occasionally, but no such predation by them upon phalaropes has come to my attention.—FRED MALLERY PACKARD, *University of Colorado, Boulder, Colorado.*

A generally unrecognized habit of the Florida Burrowing Owl.—Though having had much experience during the past seven years with *Speotyto cunicularia floridana* in the Kissimmee Prairie region of Florida, it was not until this past winter that the writer witnessed a habit of this bird of which he can find little mention in the literature. All observers of this interesting owl have been impressed with the undulating character of its flight, the low elevations at which it is usually performed and the relatively short distances covered.

Shortly before dusk on the afternoon of April 12, 1942, the writer was much surprised to see one of these owls about *one hundred* feet in the air *hovering* in exactly the same manner as a Sparrow Hawk or Kingfisher. So strange was the maneuver, and unlike anything seen before in connection with this owl, that it was difficult to believe for a moment that the individual was indeed a Burrowing Owl! It remained perfectly motionless on rapidly beating wings, sharply outlined against the glow of the western sky, for several moments, then dived suddenly earthward with startling rapidity, alighting in the prairie grass. It was so near dusk that it could not be ascertained whether any prey was secured. Two or three occasions of this sort left no room for doubt that this is a habit which must be indulged in with some frequency.

The writer was in company at the time with Audubon Warden Marvin Chandler, who patrols that area, and who has known the owl all of his life. He stated that he had long known of this habit and had witnessed it often. It did not occur to him that it was anything out of the ordinary and was surprised that it was new to the writer. Chandler further stated that he had watched owls performing in this manner at night, by the aid of his strong 'frog-light', an electric lamp worn on the head by a band, and powered with storage batteries. His attention was drawn to the birds by their notes overhead, and by holding his light on the hovering bird, he could see it plainly. The dives to earth are performed with the wings closed. It would appear that, at times anyway, this performance has a flavor of sport in it as well as a search for prey, for Chandler states that he has seen several doing it, the birds rising and falling in a way that suggests play. That area where the writer observed it was in Highlands County, Florida, in what is known as the Fish Branch section of the Kissimmee Prairie.

Search of the literature has failed to reveal much mention of this habit. Zimmer (Proc. Nebr. Orn. Union, 5, no. 5: 76, Apr., 1913) makes a brief mention of it as observed in the Western Burrowing Owl (*S. c. hypugaea*), and Hoffman ('Birds of the Pacific States': 169, 1925) is equally brief when he states that these owls (again *S. c. hypugaea*) "are occasionally seen in the twilight hovering about twenty feet above the ground, evidently hunting." In the case of the Florida birds, the hovering is performed at much greater elevations, anywhere from 75 to well over 100 feet. It is a most interesting performance and seems strange that it has escaped greater comment.—ALEXANDER SPRUNT, JR., *The Crescent*, Charleston, S. C.

Albino Western Meadowlark (*Sturnella magna neglecta*).—On June 26, 1942, I received a call from a farmer, Mr. H. W. Tucker, that his young son had found a very rare bird, a white meadowlark. The children had been walking through a pasture three miles south of Ord and had found this bird with other normal young. It had left the nest and could fly a little, but they ran it down. The bird was in perfect condition when I received it except that it was hungry. I had hopes of keeping it alive and worked for three days, feeding it any insects that it would take. The third day it developed paralysis in its legs and died.

The bird was a true albino, with the flesh, bill and toenails white, the pupil of the eye red, and the iris a light blue. Typical of the albino condition, its eyes were weak and it struck to one side of any object it tried to pick up. The feathers were pure white except for a beautiful tinge of yellow on the breast and a slight gray pattern over the back where normal coloration is dark and striped.

The bird could give the typical call of a young meadowlark and had all of the mannerisms of a normal individual.

The bird is now mounted at the University Museum in Lincoln, Nebr.—H. ELLIOTT MCCLURE, *Ord, Nebraska*.

Red-shouldered Hawk caught in mink trap.—On November 24, 1941, I examined a live adult male specimen of a Red-shouldered Hawk (*Buteo lineatus*) that had been caught in a mink trap in Avon, Connecticut. The details of the incident were given to me by a local trapper. In the dark of early morning while he was 'working his trap line' along the bank of a small stream he found a hawk desperately trying to lift a mink trap, in which it was caught, off the ground. The bird had been caught directly above the base of the toes on the tarsus. The trap used was an Oneida Victor two-jaw spring trap, size 2, which was set in three inches of water, unbaited. Over the center trigger there was a piece of sod to aid in the concealment of the trap.

Since the bird was caught on the tarsus it might well have been pursuing (by wading) some form of aquatic life, possibly batrachians.¹ It seems unlikely that the bird was hovering over its prey when it was caught. The trap was entirely inconspicuous, even to men, when seen in the daylight. The bird was not exhausted but was vivacious and alert. This might lead to a supposition that it was caught in the early hours of morning and had not been in the trap all night. It was released later as it was practically unharmed.—DAVIS W. PRATT, *The Avon School, Avon, Connecticut*.

Berberis bealei as a spring food of songbirds.—The probable great value of *Berberis bealei* as an ornamental plant attractive to birds in the eastern United States was forcibly brought to my attention while walking through the Capitol grounds in Washington, D. C., on May 27, 1942. Passing within ten feet of a clump of this Chinese species, most of whose relatives in the western United States are known as hollygrapes, I was surprised to observe a female Rose-breasted Grosbeak (*Hedymeles ludovicianus*), several Olive-backed Thrushes (*Hylocichla ustulata swainsoni*), and a Robin (*Turdus migratorius*) so intent upon securing the fleshy, blue, grape-like fruits that they did not flush upon my close approach. During the period from 1:30 to 2:00 p. m., at least five Robins, eight Olive-backed Thrushes, one Wood Thrush (*Hylocichla mustelina*), one Rose-breasted Grosbeak and six House Sparrows (*Passer d. domesticus*) were seen avidly eating the fruits. Excepting the grosbeak, which chewed the fruits and discarded the skins, and the House Sparrows, which took bites, all species swallowed the berries whole.

When first seen, about 50% of the original crop of fruits was present. When again visited on May 29, only about 30% remained. Between 10:00 and 10:15 a. m. on the latter date, three adult and two fully-grown juvenile Robins and a Catbird (*Dumetella carolinensis*) were seen taking *Berberis* fruits. One adult Robin carried two away, apparently to its nest. A female Black-poll Warbler (*Dendroica striata*) nibbled at a berry and a male Black-poll, a female (or immature male) Redstart (*Setophaga ruticilla*), and a Red-eyed Vireo (*Vireo olivaceus*) flitted about in the spiny foliage. The grosbeak and Olive-backed Thrushes seen previously had evidently continued their northward migration as they were not observed during the second visit. On both occasions, many Starlings (*Sturnus vulgaris*) were seen nearby but they did not appear to be attracted to the

¹ The bird may possibly have been bathing.—Ed.

fruits. On June 2, a friend reported all the berries eaten and a Cardinal (*Richmondia cardinalis*) biting at one of the red pedicels.

Although the attractiveness of the *Berberis bealei* clump under observation was undoubtedly enhanced by an adjacent water spray, its value as a late spring food supply for migratory and resident songbirds was strikingly evident. These observations seem to indicate that the many related species of evergreen barberries that are normally grown in this country, both native and foreign, should receive greater attention in food and cover plantings for songbirds.

[*Berberis bealei* (Fort.) DC. is synonymous with *Berberis* (*Mahonia*) *japonica* of horticulture which, in turn, is not to be confused with *Berberis thunbergii* DC. known as *B. japonica* by some authorities.]—GEORGE A. PETRIDES, National Park Service, Washington, D. C.

Fulvous Tree-duck in Louisiana.—Louisiana is so famous as a wintering ground for waterfowl that the importance of her nesting ducks often is overlooked. The Mottled Duck is the principal breeding duck of the Louisiana coastal marshes, and the Wood Duck is produced in large numbers in her extensive, wooded swamps. The Blue-winged Teal is an occasional nester, but not in significant numbers, whereas the Mottled Ducks and Wood Ducks produced in the state represent a considerable increment to our continental waterfowl population.

The Fulvous Tree-duck (*Dendrocygna bicolor fulva*) proves to be another nesting species for the state, although its importance has not been recorded heretofore. Oberholser states in 'The Bird Life of Louisiana' that the bird is fairly common in southern Louisiana, but is of irregular and local occurrence in summer, autumn, winter and spring. He suggests that it possibly breeds in the state, although no definite nesting records had appeared at the time of publication of his book in 1938.

Recent studies show this tree-duck to be a very common summer resident in southwestern Louisiana. Its range includes the coastal marshes from Morgan City to Sabine Lake, and virtually the entire Louisiana rice belt including Acadia, Vermilion, Jefferson Davis, Calcasieu and Cameron parishes. The species may be found throughout this region in summer and early fall, although concentrations tend to be localized. Occurrences east of this range must be considered occasional, while the bird is abundant in the Texas rice belt to the west. Winter records for the state are infrequent.

Tree-ducks appear in Louisiana early in summer. By the middle of July small flocks can be seen here and there in the rice fields, but at this time of year the birds are secretive and widely dispersed. Rice farmers reported that the ducks nest during this season. Federal game management agents have verified these reports, finding many instances where rice farmers had picked up tree-duck eggs and hatched them under hens. The U. S. Fish and Wildlife Service investigated these reports further during the summer of 1939. Several nests were found in Acadia Parish south of Crowley on August 13, marking the first definite nesting record for the state.

Further study showed that the Fulvous Tree-duck nests almost entirely in rice fields. Nesting occurs late in the season, usually after the middle of July, probably because the young rice does not offer sufficient nesting cover before that time. Nests are built on low rice-field levees or along dikes of larger canals. Not infrequently floating nests are built in standing rice. Floating nests are well-con-

structed rafts similar to those of the Pied-billed Grebe, averaging fifteen inches across and ten inches thick, the emerged portion being four or five inches high. Nests on rice levees are more simply constructed. Rice straw (stalks and blades of the rice plant) is the principal material used in all types of nests. Eggs vary from ten to fifteen in number, twelve to fourteen being the average clutch.

The young are distinctively marked, especially on the head and neck. Forehead and crown are a deep olive brown down to and including the eyes. Cheeks and throat are light buffy yellow, which color also extends in a band across the hind head below the crown. The dark coloration of the hind neck meets this light band at the nape, and extends across the ear region into the cheek, below and slightly behind the eye.

Many tree-ducks nests are located in fields of 'Early Prolific' rice, since this early-maturing variety offers the tallest cover during the start of the nesting season. Unfortunately, however, this rice is often harvested before the eggs in late nests hatch. Rather than see these eggs destroyed, rice farmers bring them home and hatch them under domestic hens. The young do well in captivity, and make interesting pets. When these hand-reared birds are allowed their freedom, most of them eventually rejoin their wild brethren.

During the month of September, tree-ducks become more conspicuous in rice fields. Flocks of ten to fifteen are a common sight. Many of these flocks probably represent family groups. Soon after the young can fly, these ducks begin to congregate in rice reservoirs and in ponds of the coastal marshes. Only at this time of year can the abundance of the tree-duck be appreciated. Even then, this bird at a distance is easily confused with the Glossy Ibis. The tree-duck presents a very un-ducklike appearance in flight, since its long legs, stretched out behind, remind one of a heron. The wing-beat is slow, and the bird is given to soaring and gliding. Its high-pitched, whistling call gives it the local name of 'Mexican Squealer' in Louisiana and Texas. The bird is also called 'Yankee Duck' or the French 'Canard Yankee' in parts of Louisiana.

The tree-duck cannot be classed as a sporting bird in Louisiana, since very few remain in the state until the start of the hunting season. After the fall-congregation period in September and early October, these birds disappear, probably migrating down the Texas coast. A few are killed in Cameron Parish during the first few weeks of every hunting season, but in most places the bird is so rare in winter as to be a curiosity. Tree-ducks respond readily to calling, and could be killed with ease during September and October. No decoys are necessary. The hunter merely has to walk the rice fields in early morning or late evening, waiting for the birds to fly over. This duck has a curious habit of flying in wide circles, one of which almost invariably brings the bird within range of the hunter. Under the present waterfowl regulations, the tree-duck enjoys almost complete protection from legal hunting. Illegal hunting is kept down by the widespread notion that this bird is unfit to eat. It has such a thin skin that the meat appears blue on a plucked bird, which may account for this impression.

This species is valuable to the farmer in consuming seeds of rice-field weeds. Reports of tree-ducks damaging rice are surprisingly rare, considering the abundance of the bird. It is the opinion of observers in the rice belt that the tree-duck has increased steadily during the past ten years. This is understandable since the bird receives ample protection, and is assured of abundant food, nesting cover, and water. It is not impossible that rice culture made possible the extension

of the nesting range of this bird into Louisiana, since most of this region had been prairie prior to cultivation.—JOHN J. LYNCH, U. S. Fish and Wildlife Service.

Spring migration on Farmington Bay, Utah.—Farmington Bay, at the southeast corner of Great Salt Lake, Utah, is a bird refuge consisting of several square miles of diked fresh-water ponds. It is bordered on the west by the briny, barren flats of the lake, and on the east by reeded marshes, meadowed fens, and verdured uplands extending to the Wasatch mountains a mile or more away. Vegetation consists chiefly of various species of bulrush, one of which (*Scirpus paludosus*) actually survives the brine of the lake itself, and salt grass (*Distichlis stricta*).

To check the bird arrivals I visited this bay frequently in the spring of 1942, and the records comprise an interesting chronology of this ornithologist's delight. How long the birds mentioned under February 27 had been there I am unable to say, but I first noted the others on the days indicated. I saw one Marbled Godwit on April 9, but none thereafter until April 25 when I counted a great flock of 804 individuals resting on the watered mud, a most pleasing experience. Here, then, is the list:

February 27: Nevada Red-wing (males) (*Agelaius phoeniceus nevadensis*); Lesser Snow Goose (*Chen hyperborea hyperborea*); Pintail (*Dafila acuta tzitzihoa*); California Gull (*Larus californicus*).

March 5: Wilson's Snipe (*Capella delicata*).

March 7: Killdeer (*Oxyechus vociferus vociferus*); Lesser Scaup Duck (*Nyroca affinis*); Blue-winged Teal (*Querquedula discors*); Baldpate (*Mareca americana*); Treganza's Heron (*Ardea herodias treganzai*); Redhead (*Nyroca americana*).

March 19: Lesser Yellow-legs (*Totanus flavipes*).

March 21: Coot (*Fulica americana*); Avocet (*Recurvirostra americana*); Ruddy Duck (*Erismatura jamaicensis rubida*); Greater Scaup Duck (*Nyroca marila*).

March 24: Nevada Red-wing (females in a flock).

March 28: White-faced Glossy Ibis (*Plegadis guarauna*); White Pelican (*Pelecanus erythrorhynchos*).

April 3: Long-billed Curlew (*Numenius americanus*).

April 5: Black-necked Stilt (*Himantopus mexicanus*); American Bittern (*Botaurus lentiginosus*).

April 7: Brewster's Snowy Egret (*Egretta thula brewsteri*).

April 9: Marbled Godwit (*Limosa fedoa*); Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*).

April 11: Western Willet (*Catoptrophorus semipalmatus inornatus*).

April 13: Shoveller (*Spatula clypeata*); Gadwall (*Chaulelasmus streperus*).

April 15: Eared Grebe (*Colymbus nigricollis californicus*).

April 18: Cinnamon Teal (*Querquedula cyanoptera*).

April 19: Pied-billed Grebe (*Podilymbus podiceps podiceps*).

April 25: Violet-green Swallow (*Tachycineta thalassina lepida*).

April 30: Black-bellied Plover (*Squatarola squatarola*); Black-crowned Night Heron (*Nycticorax n. hoactli*).

May 3: Bank Swallow (*Riparia riparia riparia*); Wilson's Phalarope (*Steganopus tricolor*); Caspian Tern (*Hydroprogne caspia imperator*); Forster's Tern (*Sterna forsteri*); Black Tern (*Sterna hirundo hirundo*); Western Sandpiper (*Ereunetes mauri*).

May 5: Rough-winged Swallow (*Stelgidopteryx ruficollis*).

May 9: Snowy Plover (*Charadrius nivosus nivosus*); Long-billed Dowitcher (*Limnodromus griseus scolapaceus*).

It is appropriate to include here a record of 75 Sandhill Cranes (*Grus mexicana*) seen on the bay on March 18, 1940, and reported to me by J. Donald Daynes and C. W. Lockerbie, local ornithologists.

The spring of 1942 was cold and snowy, and most flowers were two weeks or more late in their blooming.—CLAUDE T. BARNES, 359 Tenth Avenue, Salt Lake City, Utah.

Churchill Savannah Sparrow at the Florida line.—Peters and Griscom, in their 'Geographical Variation in the Savannah Sparrow' (Bull. Mus. Comp. Zool., 80: 454-459, Jan., 1938), place among "extreme records" for *Passerculus sandwichensis oblitus* single occurrences from North and South Carolina and from Elba Island, Georgia (the last taken by Ivan R. Tomkins, February 17, 1936). On the lower Atlantic Coast and throughout the southeastern corner of the United States, the migratory or wintering presence of *oblitus* has been reported no farther south than the above-mentioned island. Consequently, records of this subspecies in Florida are non-existent to date.

On December 30, 1941, seven miles southwest of Donalsonville (Seminole County), Georgia, the writer collected a very blackish Savannah Sparrow, which was found referable to the Churchill form, *oblitus*, by Dr. Harry C. Oberholser of the Cleveland Museum. The location, a large broom-sedge field, was within one-quarter mile of the Chattahoochee River, here forming the Georgia-Florida boundary. Incidentally, three other specimens of this race were secured in central-south Georgia, in January, 1940, and May, 1941. Viewing the present extension of this form's winter distribution, we can see that the probability of its being taken in Florida is now heightened. Also, with more judicious collecting, the gap between the coastal plains of Georgia and of Mississippi, wherein *oblitus* so far is unknown, can eventually be bridged.—ROBERT NORRIS, Tifton, Georgia.

The Veery breeding in Washington, D. C.—On May 21, 1942, I was surprised to find a Veery (*Hylocichla fuscescens*) singing in lower Rock Creek Park, Washington, D. C. Through the following weeks, I observed it almost daily. It had established itself in the vicinity of a woodland path that I followed regularly on my way to and from work, and it was exceptional when I passed and did not hear it singing. On June 1, for the first time, I found two Veeries in the territory. The newcomer also sang, but the typical resonance and overtone were lacking from its performance, which was rapid and seemingly perfunctory. After that, the two Veeries were repeatedly observed in the one territory, not only by me but also by Mr. William Cottrell and Lt. James M. Andrews, U. S. N., both of Massachusetts. As the month of June advanced, the two Veeries became less persistent in their singing.

On June 28, after a prolonged search, I discovered the nest of the Veeries on top of a low vine-clad shrub, some two feet off the ground, and had the pleasure of watching one of the parents feed the three partly-fledged young, which we judged to be about a week old. The three fledglings were accidentally disturbed by a human visitor on June 30 and so left the nest somewhat prematurely. No observations were made during the next few days, but on the 5th, 6th and 7th of July, respectively, I observed one of the newly fledged Veeries, already competent on the wing, taking food from one or both of the adults.

In her 'Birds of the Washington, D. C., Region' (Proc. Biol. Soc. Washington, 42: 65, March 25, 1929), Miss May Thacher Cooke gives June 2 (1907) as the latest-recorded date for the spring migration of the Veery in the Washington region. Mr. Frederick C. Lincoln has been kind enough to inform me that the species has never before been known to breed in this region and that, to his knowledge, the 1907 record has not been superseded.—LOUIS J. HALLE, JR., 2800 Woodley Road, N.W., Washington, D. C.

Sage Thrasher in New York.—On April 12, 1942, while Dr. Charles Evans, Mr. Joseph Taylor and I were driving along the East Manitou Road about a quarter of a mile south of Braddock's Bay, in Monroe Co., New York, we chanced to note an unfamiliar bird feeding in dried portions of a flooded stubble field. The actions of this bird were similar to those of a Brown Thrasher (*Toxostoma rufum*), but its general color was gray. We observed it with 8-power binoculars and 36.5-telescope for half an hour before collecting it, sometimes approaching to within thirty feet. It foraged for a time in one spot, then flew to another feeding area in the open or to a hedge row. Its streaked under parts and brilliantly yellow eye were conspicuous. It was a perfectly healthy Sage Thrasher (*Oreoscoptes montanus*).

The specimen proved to be a female. Its plumage was in excellent condition, there being no evidence whatsoever of fraying or soiling such as would result from captivity. The upper mandible was, however, more than normally long, the rather strongly curved tip protruding 3 mm. It was made into a study skin at the Buffalo Museum of Science and sent to Dr. George M. Sutton, of Cornell University, who confirmed our identification and recorded the following measurements: wing, 98.5 mm.; tail, 90; tarsus, 30.5; culmen, 19. It is now No. 12,789 in the Louis A. Fuertes Memorial Bird Collection at Cornell.

Braddock's Bay is the westernmost of a series of small ponds and bays that open into Lake Ontario just west of the mouth of the Genesee River. Gently rolling farmland lies south of the Bay. During the week preceding April 12, the temperature was below average, and westerly winds on the 8th and 9th accompanied an unseasonable snowfall. On the 12th the ground was partly snow-covered and surface water flowed freely over the fields. The day was cool and partly cloudy with a moderate west wind.

Apparently this is the first record for New York State of this distinctly western species. Indeed, we find no United States record of its occurrence east of Cameron Parish, Louisiana, where E. S. Hopkins took a male specimen on January 2, 1926, (*Oölogist*, 44: 72, 1927).—GORDON M. MEADE, *Strong Memorial Hospital, Rochester, New York*.

Notes of Mid-South towhees.—We wish to correct the impression given by a brief review (*Auk*, 59: 328, April, 1942) of our article 'Summer range of Mid-South Towhees' (*The Migrant*, 12: 51-57, Sept. 1941). The purpose was not to determine subspecies as no collecting was done. But extensive field study since 1928 shows that, with a very few isolated exceptions, no race of Towhee is present from about May 8 to mid-October, in the region from Reelfoot Lake, at the Kentucky line, to near Vicksburg, Mississippi. This hiatus in the breeding range of the Towhee includes eastern Arkansas if not most of the state, part of western Tennessee, northern and part of central Mississippi, and part of Louisiana. North, east, and south of this area the Towhee is fairly common in summer.—BEN B. COFFEY, JR., 672 North Belvedere, Memphis, Tennessee.

Nesting of the Prairie Horned Lark in northwestern Alabama.—The Prairie Horned Lark (*Otocoris alpestris praticola*), long regarded as strictly a winter visitor in northwestern Alabama, and recorded as a breeder only as far south as southern Missouri and the Ozark region of Arkansas, has now twice been found nesting here. The honor of this discovery belongs to Mr. Leslie King, of this place, who found a nest with four fresh eggs on May 22, 1942, and a second nest three days later with two eggs and one young. The first set and nest were collected; the second left undisturbed. In both cases the identity of the parent birds was fully and positively established. It is believed this is a new record for Alabama.—F. W. McCORMACK, *Leighton, Alabama*.

Red-cockaded Woodpecker breeding in Maryland.—On June 9, 1939, while studying birds on Assateague Island, a sand-bar extending some thirty-five miles from Ocean City, Maryland, southward into Virginia, I found a young Red-cockaded Woodpecker (*Dryobates borealis*) just out of its nest in a stand of *Pinus virginiana*, behind the North Beach Coast Guard Station, ten miles below Ocean City. As the bird could not fly very well I easily approached it and examined it closely.

Since locating this species breeding in the State, I have been unable to find any records concerning the breeding of this woodpecker in Maryland and therefore believe it is the first record of the breeding of the bird in the state.—BROOKE MEANLEY, *Patuxent Research Refuge, Bowie, Maryland*.

Cuban Nighthawk breeding on Lower Florida Keys.—On August 11, 1942, two nighthawks were collected on Boca Chica Key, about eight miles eastward from Key West, as they were feeding low over the ground. These specimens were sent to Mr. John W. Aldrich, Biologist of the Fish and Wildlife Service in Washington, who identified them as *Chordeiles minor gundlachi*, one being a female in the gray phase and the other considered an immature male bird. These determinations are not very surprising in view of the West Indian affinities of the Florida Keys as emphasized by certain forms of birds found here. In June of 1941 my attention was called to the notes of nighthawks over Key West by Roger Tory Peterson and a certain difference in syllables from the more northern birds was plainly noted. Since that time special attention has been given to this bird and its call, the latter generally consisting of three or four notes expressed as *killy-kadick* by Cubans living in this area and also mentioned as this by Mr. James Bond in his 'Birds of the West Indies.' These are the only notes of our summering birds along the lower keys heard by the writer. Although no nests or eggs have been found so far, the above facts lead to the belief that *gundlachi* is the nesting bird of the lower keys although it is possible that the Florida bird, *C. m. chapmani*, may also occur at that time.—EARLE R. GREENE, *Fish and Wildlife Service, Key West, Florida*.

Florida Burrowing Owl in Cuba.—I have received word from my friend, Sr. Gaston Villalba, of the taking of a female Florida Burrowing Owl (*Speotyto c. floridana*) at the Campo Florido, Havana, Cuba, on January 7, 1934. It appears probable that the individual reached Cuba from the Bahamas (cf. Bond, Proc. Acad. Nat. Sci. Phila., 94: 95-96, 1942. The specimen is now in the Villalba Collection, which includes the only Cuban examples of the Blue-winged and Bay-breasted Warblers, in addition to many other skins of interest.—JAMES BOND, *Academy of Natural Sciences, Philadelphia, Pennsylvania*.

American Three-toed Woodpecker in Massachusetts.—While investigating the winter bird life of coastal Westport in southeastern Massachusetts on February 21, 1942, Richard Bowen saw, briefly but closely, a female of the American Three-toed Woodpecker (*Picoides tridactylus bacatus*), but William H. Drury, Jr., and the writer, who were afield with him, failed to find the bird when summoned from a distance. This was disappointing since so brief an observation of so rare a bird, particularly in the coastal lowlands, could hardly be expected to stand as a satisfactory record.

On the 23rd, therefore, Mr. Bowen invited us to join him again and, our party augmented by David L. Emerson and Ivory Littlefield, Jr., we revisited the area. Studied preparations to cover the site methodically soon proved unnecessary because Emerson found the bird almost upon entering his assigned lane. Subsequently, during some two hours of criss-crossing through the stand, every member of our party obtained one or more satisfactory observations of this dark, unobtrusive 'ladderback.' At least once, two of us simultaneously observed birds from widely separated points, and Bowen, who obtained more and better observations, strongly suspects that there were three of these northern woodpeckers in addition to several individuals of our own trio of resident forms.

These observations were made in a mature stand of pitch pine (*Pinus rigida*) which occupies a narrow interval between the dunes of Horseneck Beach and an extensive salt marsh. Perhaps half the trees are dead, standing as stark, splintered reminders of the hurricane of September, 1938. The intervening four years have presumably given the bark beetles which are the favorite food of *Picoides* an opportunity to multiply, perhaps accounting for this rare bird's presence here, but not for its coming! It is interesting, however, that Mr. Ludlow Griscom mentions reports of a movement of these birds in the 'transition zone' portion of the St. Lawrence Valley this winter [*Audubon Mag.*, 44 (2): 122, 1942].—
ROLAND C. CLEMENT, 804 Walnut St., Fall River, Massachusetts.

Tufted Titmouse in Massachusetts and Connecticut.—*Baeolophus bicolor* is a very rare wanderer into New England, so when in July 1940, a sight-record at Uxbridge, Massachusetts, was brought to my attention, I skeptically got into touch with the observers, Dr. and Mrs. M. R. Sharpe, and was surprised, indeed, by what I learned. Dr. Sharpe, an elderly dentist, had grown up at Putnam, Connecticut, near the northeastern corner of that state (a section from which no tit records are known), and there, in or about 1888 and 1889, he and a slightly older boy had found a pair of tits nesting in a sops-of-wine apple-tree in an old orchard on the Leach farm. The date was early, for Flickers, in search of whose eggs they were, had made nest-holes but not yet laid in them. In both springs the boys collected tit eggs and kept the location a secret from envious rivals. Sharpe's eggs were later passed on to nephews and are lost, but it seems to me incredible that they were eggs of any other early-laying hole-nester, like Bluebird or nuthatch, whose eggs would be in every boy's collection. Moreover, when he saw a tit at his bird-bath on July 18, 1940, he recognized it instantly, and commented that it was "unusually rufous below" and so big that he guessed it to be a male. Mrs. Sharpe, two or three days earlier, had heard a *peter peter peter, de-de-de* that she knew was strange, and had observed the new bird at the bath without identifying it; and it, too, stayed around for a few days after July 18. There is, of course, no evidence, even now, of the species's nesting in New England

—despite Forbush's hospitality to a report from Maine (!) in his 'Birds of Massachusetts and Other New England States' (3: 365, 1929)—but Dr. Sharpe's observations, separated by 50-plus years, are so mutually corroborative that they seem to me worth recording.—SAMUEL A. ELLIOT, JR., *Smith College, Northampton, Massachusetts*.

Evening Grosbeak in summer in the Adirondack Mountains.—On the evening of July 9, 1942, I found Evening Grosbeaks close to the Elk Lane Camp, near Blue Ridge, Essex County, New York. They were seen shortly thereafter by Mr. Charles H. Rogers of Princeton, N. J., Mr. Hustace H. Poor of Yonkers, N. Y., and many others. There were three birds, a bright-colored male and two females. The birds appeared again the next morning and I saw a female again on July 13 and a pair on July 15. I obtained a motion picture of the male. The birds were seen on July 20 at Clear Pond, two miles from Elk Lake, but there were no further reports of them up to the time I left the camp on July 26.—EDWARD FLEISHER, *Brooklyn College, Brooklyn, N. Y.*

Catbird wintering in Bennington, Vermont.—Early in December, 1941, Mrs. Stella Higgins telephoned me that she had a Catbird coming to her feeding station. Although doubting the report, as soon as I had an opportunity I visited her place. Sure enough, there was the Catbird. It seemed hale and hearty. From that time until February 15, 1942, the bird was a daily visitor to the feeding station. I saw it many times. Mrs. Higgins said that its visiting hours were usually about the middle of the morning, between one and two in the afternoon, and just before dusk. An effort was made to locate the place where it spent the night, but without success.

Late in the afternoon of February 15 it came to the feeding station as was its wont. It seemed as active and alert as ever. While Mrs. Higgins was watching it feed, it suddenly flew up from the ground to a height of five or six feet, and dropped back dead. We, being uncertain as to the cause of death, sent the body to the Museum of Comparative Zoölogy at Harvard College.

Mr. James L. Peters's report was this: "It was a male in good condition, not overly fat, but with some adipose tissue. No sign of old injury. Death was probably due to a blow on the back of the skull. Though the skull itself was not injured, there was a hole in the skin below and to the right of the occiput, and a small amount of intercranial hemorrhage. The bird might have been attacked by a shrike, or hit something in flying up. Anyway death was due to injury and not to weather conditions or starvation."—LUCRETIVS H. ROSS, *Bennington, Vermont*.

Second record of the Wood Thrush in Colorado, with other observations.—During the week of May 11, 1942, a number of unusual eastern species of birds were discovered on the campus of the University of Colorado, at Boulder, and since one of these is the first specimen of its kind to be taken in the state, it seems advisable to record them all at the same time. The observations below were made by students of the University, including Miss Luella Hamilton, Miss Verna Mace, Mr. Malcolm Jollie, Mr. William Jaeger and the writer, and by Dr. Gordon Alexander, Head of the Department of Biology. Eight-power binoculars were used, and in every case the birds were observed at such close range that positive identification was possible.

Wood Thrush (*Hylocichla mustelina*). One adult male was found dead on the campus, May 13. This is the first specimen from the state, there being but one previous observation of the species in Colorado, at Yuma, May 27, 1905 (Henderson, J., Colorado Notes, Auk, 22: 421, 1905). This specimen is preserved in the University Collection.

Black and White Warbler (*Mnotilta varia*). One male was found dead May 13, and one female observed May 15 by Mr. Jollie and the writer. The only previous records from this vicinity are of one seen June 1, 1880, at Boulder (Minot, H. D., Notes on Colorado Birds, Bull. Nutt. Orn. Club, 5: 181-182 and 223-232, 1880; 6: 89, 1881), and of two observations May 6 and 12, 1933, at Boulder (Alexander, G., The Birds of Boulder County, Colorado, Univ. Colo. Studies, 24: 79-105, 1937).

Tennessee Warbler (*Vermivora peregrina*). One was observed on May 15 by the writer. This species is an "infrequent transient and probable summer resident" (Alexander, *ibidem*) in this area, and observations of it are very scarce.

Magnolia Warbler (*Dendroica magnolia*). An adult male was observed May 15 by Mr. Jaeger and the writer. R. J. Niedrach and R. B. Rockwell ('Birds of Denver and Mountain Park,' Denver, 1939) cite four records of this species from the state, the most recent being of one near Denver on May 20, 1913.

Black-throated Blue Warbler (*Dendroica caerulescens caerulescens*). An adult male was observed on May 15 and 20 by Dr. Alexander, Mr. Jollie and the writer. The only previous record of the species from the Boulder region is a specimen in the University collection dated October 16, 1941 (Alexander, *loc cit.*).

Chestnut-sided Warbler (*Dendroica pensylvanica*). An adult male was observed April 29 by the writer. The only previous records of this species from Colorado are of a male taken near Barr Lake by R. J. Niedrach, May 16, 1933, and a male reported near Denver on May 31, 1935 (Niedrach and Rockwell, *loc cit.*).

Black-poll Warbler (*Dendroica striata*). Three or more were seen and heard on May 15 and 16 by Misses Hamilton and Mace, Dr. Alexander, Mr. Jollie and the writer. Although somewhat less uncommon than the other warblers mentioned, this species is rarely encountered, and the occurrence of several at once is noteworthy.

It has been suggested that the occurrence of tornadoes in Texas during the week of May 4 may have been responsible for the appearance of some of these individuals some distance from their usual ranges.—FRED MALLERY PACKARD, *University of Colorado, Boulder, Colorado.*

Hudsonian Godwit in Wayne County, New York.—Through the interest and courtesy of Mr. Nelson L. Drummond of Auburn, New York, Cornell University has recently come into possession of a fine immature male Hudsonian Godwit (*Limosa haemastica*), the only New York specimen of this species in our collection.

The bird was taken by Mr. Drummond himself at Crusoe Lake (not far from the town of Savannah), in Wayne County, New York, on October 26, 1941. It was seen on the 25th "half-heartedly chumming with two yellow-legs" and on the 26th "with five or six small plover." But for old scars toward the tip of the upper mandible it was in perfect condition, though it was not very fat (weight: 188 grams). Eaton, in his 'Birds of New York' (N. Y. State Museum Memoir, No. 12: 322, 1910) lists five 'inland' New York State records, one of these (Ithaca, Tompkins County, Nov. 5, 1878) being from the Cayuga Lake district.—GEORGE MIKSCHE SUTTON, *Cornell University, Ithaca, New York.*

Blue Geese on National Wildlife Refuges of the Atlantic Coast, Winter of 1941-'42.—Information contained in reports from refuge managers in charge of national wildlife refuges along the Atlantic Coast indicates the continued trend (Auk, 52: 432-441, 1935; 57: 524, 529, 1940) for small numbers of Blue Geese (*Chen caerulescens*) to move eastward during periods of migration, and to winter on that coast.

An observation of perhaps the largest Blue Goose flock in the Atlantic coast was reported by Mr. Albert L. Stadlmeir, manager of the Brigantine National Wildlife Refuge, Absecon, New Jersey. A flock of 45 birds was observed on December 18, 1941, feeding with a large flock of Snow Geese on Egg Island, near Fortescue, Cumberland County, New Jersey. Mr. Stadlmeir stated that during the past 15 years some Blue Geese, ranging in numbers from 15 to 45, have been seen with Snow Geese during the occasional visits made to this Delaware Bay marsh area.

Mr. John F. Herholdt, manager of the Bombay Hook National Wildlife Refuge, Smyrna, Delaware, reported that on November 1, 1941, a flock of 12 Blue Geese was noted with approximately 3,000 Snow Geese on the refuge. By November 13, a count indicated 18 Blue Geese and 4,700 Snow Geese. While the number of Snow Geese increased thereafter to an estimated 10,000 by December 1, and 12,000 by December 22, the Blue Goose population remained constant at 18 until the birds departed by January 3, 1942. This is the same number as noted on the refuge area on December 11, 1939, by L. W. Saylor (Auk, 58: 92, 1941) although Mr. Herholdt reported (in litt.) that the 1939 migration of Blue Geese was first noticed on December 10, with a total of 18, and increased to the maximum of 27 on December 16. A few Blue Geese have been noted on the refuge each winter since 1937. The number of Snow Geese on the Bombay Hook Refuge in 1941 was approximately the same as reported for 1940 (Auk 59: 302, 1942).

During November and December 1941, the Snow Goose population on the Back Bay National Wildlife Refuge, Pungo, Virginia, gradually increased in numbers until by the first week in January the number was estimated by Manager Harry A. Bailey as between 13,000 and 15,000. With this flock were 36 Blue Geese of which 9 were birds of the year. A few Blue Geese have been noted in the refuge each winter since 1939.

On the Mattamuskeet National Wildlife Refuge, New Holland, North Carolina, Manager Maynard S. Johnson noted Blue Geese with the Canada Geese, as had been the case during six of the previous eight winters. Five Blue Geese were noted with an estimated 20,000 Canada Geese on December 23, 1941, and the same number was present in January.

Only about 100 Snow Geese were present on the Pea Island National Wildlife Refuge, Manteo, North Carolina, November 1, 1941, but by January 9, 1942, a peak population was reached, estimated by Mr. Samuel A. Walker, manager, to be 10,000. With this flock were "10 to 15" Blue Geese, which Mr. Walker stated was about the number seen on the refuge each of the past few winters. The Service files contain 23 different observations of Blue Geese on this refuge, a few being reported each season (Auk, 58: 106, 1941), but only on December 19, 1938, when 22 were noted, and on November 27, 1940, when 23 were seen, did the number exceed those present during the winter of 1941-42.

On the Cape Romain National Wildlife Refuge, McClellanville, South Carolina, Manager Andrew H. DuPre reported seven Blue Geese present on the Cape

Island pond. These birds, as at the Mattamuskeet Refuge, were associated with Canada Geese. Seven Blue Geese were noted on November 17 and 22, 1941, and one was seen on January 16, 1942. The maximum number of Canada Geese was 111 on December 31.—PHILIP A. DUMONT, *Fish and Wildlife Service, Chicago, Illinois.*

Records and Notes from St. Croix, Virgin Islands.—*Ixobrychus exilis exilis.* The Least Bittern first came under observation on St. Croix on May 5, 1939, and again on August 16, 1940, when a pair was flushed from the low mangroves bordering Krause Lagoon. The birds were not seen again until July 21, 1942. On that date a female flushed from her nest where already she was incubating two pale blue eggs. I instantly observed that the nest was that of the White-crowned Pigeon (*Columba leucocephala*) and of recent construction of coarse sticks and unused. A large colony of these pigeons was nesting in the mangroves at the time. The nest was located in a small mangrove bush growing in soft mud, in eight inches of water, one hundred yards from the border of the lagoon.

Oxyechus vociferus rubidus. Nesting records of the Antillean Killdeer show that two or three eggs may comprise the full complement of a single clutch. It is, therefore, of interest to cite an instance when, on May 10, 1942, a nest was found which contained seven eggs deposited in a shallow, unlined cup whittled out of the center of a twelve-inch splash of dry cattle droppings. The background blended so perfectly that the eggs could not be discerned beyond a distance of ten feet. The eggs are uniform light gray color and are spotted and sprinkled with sooty black. Measurements in millimeters: six eggs, 39 x 28; one egg 36 x 28. It should be remarked that the nest site was on the slopes of an extensive pasture land and that a careful search of the area did not reveal the presence of a third bird. Also note the uniform coloration of the eggs and especially the measurements. There is every reason to believe that all of the eggs comprised the clutch of a single female.

Catoptrophorus semipalmatus semipalmatus. The Eastern Willet has long been a regular winter visitant to St. Croix. In the summer of 1938 I made the observation that a few pairs had overstayed the date of departure, and a month later my presence in the same area of the marsh aroused their considerable resentment, convincing me that nesting had begun. That year, and every year since then, searching was in vain until May 11, 1942. On that date I flushed a female bird from a nest placed in the midst of a bed of short, fibrous plants growing on an open sandy stretch; it was a well-formed cup made of plant stems, built up above the level of the ground. The nest contained four eggs, varying in ground color from pale olive-buff to deep olive-buff, splashed broadly with irregular spots of light seal brown, fuscous and shades of gray. Measurements in millimeters: 51 x 37, 52 x 37, 52 x 37, 52 x 37.

A second nest, found on May 21, also contained four eggs and the female was collected when she flushed ten feet away. Three of the eggs are olive-buff in ground color with the usual dark spots, and the fourth is pale olive-gray with a few splashes of grayish olive and seal brown. Measurements: 55 x 40, 54 x 40, 55 x 40, 54 x 40.

Dendroica chrysoparia. The adult male of the Golden-cheeked Warbler, a tree haunting species, is easily distinguishable from the male of the Black-throated Green Warbler (*D. virens*), the only other warbler with which, in some plumages, it may be confused. On November 23, 1939, I was working my way stealthily

through a neck of woods, finding it easier than to follow the water course, when quickly a male warbler fluttered down from the dense foliage in the wake of a swiftly-escaping winged insect. This bit of jungle tragedy was enacted at a distance within ten feet of me. While I was being carefully scrutinized by the excited little bird, I took good care to note his general and characteristic markings. The golden cheek patch was prominent and the pure black dorsal area was too conspicuous to be confused, even for one moment, with the greenish coloration of the male Black-throated Green Warbler.

Again on January 8, 1940, while rambling through the same woodlot, I observed a similar adult warbler, and its occurrence in the vicinity where the first was seen is, I believe, reason enough for concluding that the same bird was seen twice. A further check-up was made in February of this year while on a visit to the American Museum of Natural History and Dr. Chapman kindly permitted me to compare his large series of skins of *D. chrysoparia* and *D. virens*. This is a first West Indian record.—HARRY A. BEATTY, *Christiansted, St. Croix, Virgin Islands, U. S.*

RECENT LITERATURE

Disappearing wildlife.¹—When the white man arrived in North America, he found the woods and fields teeming with animals of many sorts in an abundance unexcelled in any other part of the world. Throughout the subsequent years, one species after another has found its range restricted or its very existence threatened through causes sometimes incident to the settlement of the country but usually because of unrestricted persecution. Some of the species were driven to such reduced numbers that they were unable to survive and disappeared forever. A few of these were still present when certain far-seeing men, realizing the danger, opened campaigns to preserve the last remnants, but their efforts came too late to save all of them. The list of extirpated forms continued to lengthen, although less rapidly than before. Some of the forms were saved but are still in danger. Others have suffered from new crises and require renewed vigilance to prevent their following in the wake of their predecessors. The present volume deals with these threatened creatures.

Beginning with a general account of the trend of events that brought about the present situation, the book then takes up one species after another, discusses its habitat, appearance, and behavior, and gives something of its history in contact with its chief enemy, man, with emphasis on the factors that have brought about its present danger. Less attention is given to the species that are utterly extinct. Among the forms discussed are two birds under United States dominion in Puerto Rico and Hawaii, respectively.

The book makes very evident how efficiently and how soon the proper measures must be taken to give these remnants a chance for continued existence. It is a powerful document for conservation that will appeal to every lover of unspoiled nature and that should be read by those who are not of that fraternity.

The illustrations by Walter Weber are very pleasing and add greatly to the attractiveness of an exceedingly readable book.—JOHN T. ZIMMER.

Birds of the Americas.²—This long-awaited volume brings together, as the earlier parts have done, the pertinent references and records of the species of a number of orders of American birds which have been among those most needing attention. Cases are still numerous in which additional material must be found and studied before satisfactory conclusions can be reached, but a great step forward has been made in bringing these cases to attention as well as in arranging all the known American forms in order. The value of the foundations here laid in place will be best appreciated by workers who have had occasion to work in the groups included in this account but they will be apparent to all students of American birds.

The authors disclaim any intention of writing a monograph of the groups discussed, but the copious critical notes make the treatment virtually monographic

¹ 'Fading Trails.' The story of endangered American wildlife. Prepared by a committee of the United States Department of the Interior, National Park Service, Fish and Wildlife Service. Daniel B. Beard, Chairman, Frederick C. Lincoln, Victor H. Cahalane, Hartley H. T. Jackson, Ben H. Thompson. Illustrated by Walter A. Weber. Edited by Charles Elliot. 8vo, xv + 279, 20 pls. (4 col.), 12 figs., 1942. The Macmillan C. Price \$3.00.

² Hellmayr, Charles E., and Conover, Boardman. 'Catalogue of Birds of the Americas.' Part 1, Number 1. Rheidae, Tinamidae, Cracidae, Tetraonidae, Phasianidae, Numididae, Meleagrididae, Opisthocomidae, Gruidae, Aramidae, Psophiidae, Rallidae, Heliornithidae, Eurypygidae, Cariamidae, Columbidae. Field Mus. Nat. Hist., Zool. Ser., 13, pt. 1, no. 1 (Publ. 514). 8vo, vi + 636, April 30, 1942.

as has been the case in previous volumes by Dr. Hellmayr. The groups of birds in this part of the 'Catalogue' are among those which have long been the special field of Mr. Conover and his own magnificent collection of game birds has furnished the largest part of the critical material examined in this connection. His studies of these and other specimens in this country and Dr. Hellmayr's familiarity with the European collections, some of which have been available for re-examination, have placed an unusual amount of material at the authors' critical disposal.

The general trend of the adopted arrangement is in the direction of consolidation of genera and species, a trend with which the reviewer is in full sympathy. Synonymies are carried to December 31, 1939, with occasional reference to more recently described forms. *Penelope dabbeni* is proposed as a new name for *P. nigrifrons* Dabbeni (not of Lesson).—JOHN T. ZIMMER.

Experiences with birds.¹—In spite of Mrs. Jaques's disavowal of any inborn interest in birds, it is obvious that she now has a truly sympathetic affection for them, cultivated though it may have been. Her latest book gives a running narrative of her travels with her artist-ornithologist husband in his search for background studies for museum habitat groups, in vacation excursions, and in simpler countryside walks—travels that took them into the lake region of Minnesota, the swamps of Arkansas, and the rocks of the Gaspé Peninsula, to the New Forest of southern England, the mountains of Switzerland, and the tropical forest of Barro Colorado Island in the Panamá Canal Zone. Everywhere there were birds, strange ones whose acquaintance was to be made or familiar ones whose appearance in new surroundings aroused pleasant recollections. And always there were new experiences, new places, and new friends, human as well as feathered. Mrs. Jaques treats all of them alike, with a spontaneity and a lightness of touch that is refreshing.

No attempt is made at any technical discussion and yet there is much sound observation on bird life ably, if casually, brought to light. There is not a page of out-of-doors experiences that does not radiate the freedom of wood, field, sea-shore, or sky as seen through the author's appreciative eye.

Mr. Jaques's illustrations are charming studies in black-and-white that give a feeling of color and carry the same breath of outdoors that is found in the accompanying text.—JOHN T. ZIMMER.

Stuart Baker on cuckoo problems.²—When a man has been interested in a problem over a period of many years and has had opportunities rarely equalled both for acquiring pertinent data and material, and for coming to grips with the various aspects of his subject, his final summing up of his information and his interpretations of it, can hardly fail to be of the greatest interest to his fellow workers. According to Poulton's foreword to Baker's book, the author has a collection containing about 6000 cuckoos' eggs, and has had "... the advantage of some 70 years' personal study of cuckoos and their life-histories ..." and that the present volume contains, "... the result of that study, intimately combined with the work done by previous writers in many countries." With this in mind let us proceed to a consideration of the book itself and see what Baker has been able to extract from this unusually fortunate combination of large experience, much material, and more than ample time.

¹ Jaques, Florence Page. 'Birds across the Sky.' Illustrations by Francis Lee Jaques. 8vo, xii + 240, 25 illustr. Harper and Brothers. New York and London. Price \$2.50.

² Baker, E. C. Stuart. 'Cuckoo Problems.' H. F. & G. Witherby Ltd., London, 8vo, pp. xvi + 207, 12 plates, 1942. Price 25 shillings.

To begin with the materials Baker has collected; a series of appendices (pp. 181-207) gives in simple, almost tabular form the amazingly long lists of cuckoos' eggs with fosterers' in his collection, arranged by each species and subspecies of cuckoo, some 38 forms of which are included. For the Common Cuckoo, *Cuculus canorus canorus*, some 80 fosterers are listed involving no fewer than 1501 eggs of the cuckoo; of the Khasia Hills Cuckoo, *Cuculus canorus bakeri*, the number of fosterers included in the collection is 127 with 2117 eggs of the cuckoo; of other forms smaller but still significantly large series are mentioned. All in all, these lists are valuable source material for interpretative reasoning, but their value resides in the degree to which their reliability may be trusted. In this connection we may quote Baker's comments on the assistants who helped him in his work in India. "Most of these have been amateurs, but keen and capable observers, employed in our Indian and Colonial services or men in the Army and Navy. My paid collectors . . . have in every case sent the skins of the parent birds with the eggs taken. Otherwise I have not accepted them as beyond doubt. My Indian collectors have been four Khasias . . . Nagas or other Hill tribesmen, and trustworthy beyond all doubt . . . I emphasize this as it has often been said that Indians are not to be trusted implicitly in such work . . . Again it must be remembered that the wild tribes do not lie and, if the trivial offence of cutting off the heads of other people is omitted, they have no petty sins . . ." The reviewer does not doubt that Baker is entirely sincere in all this, but nevertheless he feels that the material collected under such circumstances is not of such impeccable authenticity as to constitute scientific data. Quite probably the bulk of the material is acceptable, but with no way of telling which eggs were collected by reliable persons with an understanding of what facts were important and which by natives desirous of pleasing an official of the government, it is manifestly impossible to accept the records with the same simple faith that the author is inclined to trust. The reviewer has had ample experience with well-intentioned natives in tropical areas and knows that their good intentions are very apt to outdistance their loyalty to a kind of accuracy for which they see no need. It is very unfortunate that so much material should have been collected over so long a period, most of it doubtlessly good, too, and yet be rendered open to suspicion by the inclusion of a mass of uncritically accepted specimens.

So much for the material on which the author's studies have been founded; it is not to be expected that Baker would agree with all that has been said above, but probably he would be surprised if the objections were not raised. He has satisfied himself, but this confidence cannot be transmitted to others, and is therefore not of the stuff of which evidence is built. We may now turn to the rest of the book and see what data, inferences, and conclusions Baker has been able to extract from his material. As might be expected from a man who has been primarily engaged in collecting specimens, the cuckoo problems that interested him most are cuckoo-egg problems. We find, accordingly, that the first half or more of his book is given over to a discussion of the general problem of adaptive similarity between the eggs of the cuckoos and those of their fosterers, a problem that has long been of primary interest to the author, and one on which he has published before (*Proc. Zool. Soc. London*, 1923). To state the problem simply, the known facts are these: while the individual species of cuckoos victimize many species of birds the tendency is for each individual hen cuckoo to use nests of but a single species of fosterer; the eggs laid by any one individual cuckoo are

all very similar although there may be wide variation in the eggs of each species of cuckoo; in a large number of cases there is a general (and in some cases a close) similarity between the eggs of the parasite and those of its host or fosterer. In this discussion Baker's knowledge of a good number of different species of cuckoos and their eggs enables him to avoid the partial perspectives so frequently mistaken for the whole picture by workers with geographically and systematically more limited (even though more intensive) data.

He begins with a consideration of the need for adaptive similarity between cuckoos' eggs and those of their fosterers, as without a need it would be hard indeed to explain its evolution. The main body of evidence he relies on to prove this need is a record of percentage of desertions of their nests, after cuckoos' eggs had been laid in them, by birds whose own eggs bore varying degrees of resemblance to those of the parasites in each case. Aside from the fact that there is nothing in the way of observational evidence that the nests were deserted because of the cuckoo's eggs, there is nothing definite stated by which the reader can even know that the nests were actually deserted when collected. However, even taking the material as Baker presents it, we find that the elimination of unlike eggs by desertion is as follows: of a total of 'normal' fosterers involving some 1662 cuckoos' eggs, there were 137 desertions or 8.02%; of 'abnormal' fosterers involving 278 cuckoos' eggs, 71 or 25.5% were deserted. By 'normal' is meant frequently parasitized; by 'abnormal,' the opposite. In evaluating these data we must remember that collectors are always prone to take 'unusual' sets of eggs and so the chances of the collectors' inclination to assume that desertion had taken place are greater in the 'abnormal' than in the 'normal' group. Also, taking all the eggs of all fosterers together, the total desertions are 11.2%, certainly not very greatly different from that of the 'normal' group alone. Baker is too inclined to 'explain away' exceptions to his idea; thus, while he is apparently aware of the fact that while the Black-headed Shrikes are commonly victimized, their desertions total as high as 35.30%, but this he writes is due to factors in the habits of the host rather than to lack of adaptation in the eggs of the cuckoo. We may be pardoned if we ask why should a lesser percentage of desertions be a selective factor in the evolution of adaptive similarity in cuckoos' eggs (by gradually eliminating the non-similar egg-layers), while a higher percentage of desertions seems to have had no such effect on the numerical status of those cuckoos that parasitize the Black-headed Shrike. Also, he finds that in the British Isles there is relatively little adaptive similarity between the eggs of *Cuculus canorus canorus* and those of its fosterers while on the European continent the similarity is much greater (with the same hosts in many cases). This he explains as due to the assumed probability that the cuckoo is a recent addition to the British avifauna and that sufficient time has not elapsed for the adaptive resemblance to be brought about. But if this be so, are we to believe that the cuckoos settling in Britain came from elsewhere than the European continent and failed to bring with them the more perfectly adaptive egg colorings they had there?

Similarly Baker's data on elimination of unlike eggs by ejection are open to question. When a host ejects a cuckoo's egg from its nest, it may be because it senses an unfamiliar and therefore disturbing object in the nest, but when the same bird frequently accepts and incubates the cuckoos' eggs are we to attach more importance to the occasions of rejection than of retention? So many factors may influence the behavior of the host on its return to the nest that it is dangerous

to fall back on too simple an explanation. It is apparently well established that certain species eject cuckoos' eggs far more frequently than others, but would they not treat any foreign bodies in the same way? (In the case of the North American Yellow Warbler, Cowbird eggs are often buried by the building of a new floor to the nest over them. However, the warblers were found to treat acorns in the same way.)

It cannot be denied, however, that while to some extent, in some species of cuckoos, the adaptive resemblance of eggs to those of the common hosts, is not too well established, there is nevertheless something valid in it, while in others the similarity is too great and consistent to be purely coincidental. In bringing his vast material to bear on the exposition of these cases Baker makes his most notable contribution to our knowledge of cuckoos. In attempting to explain the development of this adaptive similarity, Baker, like many other workers, inclines to the idea that each species of cuckoo is composed of many 'gens' each of which is specific in its parasitism on a single fosterer species and that each individual is true to its 'gens' in its choice of hosts. While there is a great deal to be said for the 'gens' concept, it should always be remembered that it is only an hypothesized idea, and not an established fact. As long as it helps to define and clarify the problems that cuckoos present to the investigator it is worth while, but we are all too prone to fall back on a convenient concept with such a feeling of relief that we forget to remember its factual status.

The other cuckoo-egg problem that Baker discusses in detail is the manner in which the egg is placed in the nest. While admitting that the work of Chance and his followers has clearly shown that *Cuculus canorus* lays directly into the nest, even in cases where the nest is doomed and the opening small, Baker still clings to the idea that some cuckoos may at times lay their eggs on the ground and then project them into the nest. In support of this he cites observations of Livesey and others on Burmese and Indian cuckoos, all of which leave something to be desired in the way of completeness, although of very definite suggestive value. The reviewer should state at this point that he may be unconsciously biased and expect too much in the way of proof, but he is not convinced that cuckoos ever regularly use this method of getting their eggs into the nests.

Other cuckoo problems such as the matter of territory, the number of eggs laid and any subsequent interest in them on the part of the layer, are dealt with more briefly as they are relatively outside the author's main interest and are based largely on inconclusive data. These chapters, like the rest of the book, are of interest to special students, who are competent to extract the wheat from the chaff, but are of lesser importance for the general reader.

It is interesting to note, in conclusion, that the old notion that cuckoos carry their eggs in their bills and place them in nests into which they cannot otherwise enter is hardly mentioned but merely hinted at as a not yet entirely disproved possibility.

Eight colored plates of eggs and four black and white plates of birds and nests serve to illustrate this compactly written and well printed book. The lack of an index is a drawback but not great enough to make the book difficult to use. In spite of all the points in which the present reviewer disagrees with the author, the book is full of interest, and should be consulted by anyone intending to study the fascinating problems presented by the cuckoos. Anyone who has done field work on these most difficult birds realizes that it is far easier to find fault with

what has been done than to find the correct answers to his questions.—HERBERT FRIEDMANN.

Birds of North Carolina.¹—In the twenty-three years since the earlier volume on 'The Birds of North Carolina' by the same authors was published (N. Car. Geol. Econ. Survey, 4: 1-380, 1919), now long out of print, much additional information has accumulated on the subject. The new book brings the account up to date and gives discussions of the occurrence and local distribution of 396 species and subspecies.

As in the former work, each form is succinctly described and in most cases figured, the general range is given as is the range within the state, and there is a varying amount of discussion of behavior, song, nesting, vernacular names, dates of record, and similar facts of interest. Species of possible but yet unrecorded occurrence within the state are noted for the benefit of future observers. The book thus makes a convenient manual for the use of local students as well as a work of reference for persons outside the state.

The illustrations comprise full-page plates in color by Bruce Horsfall and in color and black-and-white by Roger Tory Peterson and text-figures by Peterson and Rex Brasher. These form a useful adjunct to the descriptions in the text.

In the main, the adopted arrangement follows the fourth edition of the A. O. U. Check-List but includes a few subspecies described subsequently to that list while discarding other novelties of whose validity the authors are not convinced. This may cause some confusion although the distinguishing characters of the recognized forms are given in the discussions.

The book will undoubtedly be of great service to the bird students of North Carolina who will have in a convenient form an up-to-date resumé of the pertinent information on the birds of their state.—JOHN T. ZIMMER.

Report on the Ivory-bill.²—Realizing that the time was getting short in which information could be gathered about the fast-disappearing Ivory-bill, Mr. Tanner was commissioned by the National Audubon Society to investigate the species in its present and former homes and learn what could be found about its way of life, its essential requirements, the causes of its diminishing numbers, and the possible measures to be taken to rehabilitate it. A total of some twenty-one months were spent in the field in the South and the results of the study are presented herewith.

Mr. Tanner found a probable maximum of twenty-two birds living in 1939 in Florida and Louisiana with a slight possibility of others in South Carolina. The cause of disappearance from much of the former range has been due, as has been suspected, to the destruction of the forest by unrestricted logging operations. These have left no succession of dying or recently dead trees to support the particular sorts of boring insects on which the Ivory-bill is accustomed to feed. Long-dead trees do not support the same insect populations and may furnish food for the Pileated Woodpecker but not the Ivory-bill. A relatively large area is needed to supply dying trees in sufficient quantity and selective logging pro-

¹ Pearson, Thomas Gilbert, Brimley, Clement Samuel, and Brimley, Herbert Hutchinson. 'Birds of North Carolina.' 8vo, xxxii + 416, pls. 1-37 (20 col.), 4 portrs., text-figs. 1-141, 1942. State Museum Division, N. Car. Dept. Agr., Raleigh. Price \$3.50.

² Tanner, James T. 'The Ivory-billed Woodpecker.' Research Report No. 1 of the National Audubon Society. Imper. 8vo, xii + 111, frontisp. (col.), pls. 1-20, figs. 1-22. New York, October, 1942. Price \$2.50.

cedure or an adequate stand of untouched woodland is a necessary part of any program designed to save the Ivory-bill from extinction.

Maps are given showing original and present ranges and details are given of the data on which these maps are based. There are chapters on habitat, population density and range, food and feeding habits, behavior, nesting, and other topics. Some nesting failures were found, due to destruction of nests by unknown enemies and once because of infertile eggs. The species has a long breeding season and lack of synchronization of the sex-cycles of individuals of opposite sexes is mentioned as a possible factor likely to be effective in a reduced population.

A colored frontispiece by George M. Sutton and numerous photographs and line drawings illustrate the brochure which makes a most interesting and informative report. It is hoped that it will spur the effort so that effective measures may be taken to preserve the last remnants of this magnificent bird.—JOHN T. ZIMMER.

Labrador investigation.¹—This book is an account of an expedition by the author, Assistant Curator of Ornithology, and J. K. Doult, Curator of Mammalogy of the Carnegie Museum of Pittsburgh, under the auspices of that Institution, during eight months of the year 1938, into two subarctic areas, the unorganized District of Ungava, just east of Hudson Bay on the Labrador Peninsula, and the Belcher Islands out in the Bay only 60 miles off shore. It was in part a search for Kasagea, an unknown seal, and in part a general biological survey of the Labrador Peninsula. This was one of nineteen expeditions sponsored by the Museum within the last thirty years into the Hudson Bay region, a series which began with that of 1914 by Claude J. Murie—all with the ultimate objective of a complete survey of the Labrador Peninsula. Of these surveys, fifteen were conducted under the general supervision of W. E. Clyde Todd, Director of Biology of the Museum. The present 1938 expedition combined two originally separate projects. One of these was to winter in the interior of Ungava, and the other was to spend a spring on the Belcher Islands of Tukarak. Starting from Pittsburgh soon after New Year in 1938, they proceeded by rail via Cochrane, Canada to Moosonee and Moose Factory, where they arrived at 25 degrees below zero. From there they proceeded by airplane via Fort George to Great Whale River. The months which followed were spent not only in trips on land and on ice by dog-sled and later by boat to Belcher and Sleepie Islands, but also in making numerous brief side trips en route, and in making their final return to base at Cochrane.

The material in this book relating to birds ranges from very brief mention of the distribution of certain species to considerable information pertaining to life history, habits or ecology of other species. There are discussions of varying length of such topics as the singing of American Pipits, the mating call of geese, collecting raven eggs and nests, the mating of the Purple Sandpiper, the method of construction of nests of geese, the habitual Eskimo practice of making use of greatly decayed eggs as food, Jack Miner and his bird sanctuary in Ontario, and, of especial interest, numerous bird observations made from airplane in Ungava between Moose Factory and Great Whale River port.

While the scope of this notice is limited in general to consideration of those

¹ Twomey, Arthur C., in collaboration with Nigel Herrick. 'Needle to the North: the Story of an Expedition to Ungava and the Belcher Islands.' 8vo., 560 pp., 53 illus., maps, 1944. Boston, Houghton Mifflin Co. Price \$3.50.

sections of ornithological interest, it should be added that the book contains considerable material on general natural history, ranging from brief notes on *Cladocera* to discussion of life history, habits and distribution of various species of seals. There are likewise observations of ethnological interest pertaining to the various Eskimo and related people inhabiting the regions studied. Presenting their work in semi-popular style, non-technical language and in simple narrative form, the authors have been able to share with their readers full and vivid impressions of memorable days. Both are naturalists of sufficient insight to enable them to deal sympathetically with the unusual situations in which they occasionally found themselves, and to relate their experiences in such a way as to make 'easy reading' to a degree far above the average for a work of this kind. The study of this book is heartily commended.—J. S. WADE.

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CORRESPONDENCE

PRESENTATION OF NESTING DATA: FURTHER DISCUSSION

20th July, 1942

EDITOR OF 'THE AUK':—

I have just been able to see Mr. F. A. Pitelka's interesting letter on "Presentation of nesting data" in *Auk*, 58: 608-612, 1942. His points needed making.

The question of the time-unit to be used is not easily solved: even within my own experience of swallows and swifts I have found that the numbers of visits with food between dawn and dusk can in one species be as high as 328, in another as low as 5.

Mr. Pitelka writes that a 200-minute unit "may be satisfactory for such species as swallows, which feed their young comparatively frequently; but for slower feeders, a longer period is needed. It seems more generally practicable to retain the hour unit for expressing feeding rate, but observations should extend over at least 5-8 hours." Now I am still in doubt about the best unit myself and I should welcome standardization, but what exactly is Mr. Pitelka's recommendation? Does "the hour unit" mean "a unit of one hour"? Hardly, for that would be shorter than the 200-minute unit, not longer. Does it mean a "unit of a multiple of an hour"? If so, it is necessary to decide on the multiple. Since Mr. Pitelka feels that "observations should extend over at least 5-8 hours"—with which I agree and would strengthen into "on any one day observation should be continuous for at least 5 hours"—should we take the time unit as 5 hours, i.e. 300 minutes? (It would certainly be unsound to make our time-unit longer than our minimum acceptable observation period.)

Actually I chose a 200-minute period as being the shortest "round-number" period that would give a rate greater than 1 for the slowest-feeding species: and I preferred a unit quoted in minutes because I hoped to lessen the risk of confusion with the familiar "per hour," that tends to be in the back of everyone's mind. In this I have not succeeded: in *Ibis*, 1942, 198, the reviewer of my study on the Wire-tailed Swallow (*Proc. Zool. Soc. London*, (A) 109: 109-125) overlooked the fact that the rates I quoted were on a 200-minute unit, translated my data into 150-200 visits *per hour*, and quite understandably insinuated that the Africans employed as watchers had to be preternaturally good observers to note the particulars prescribed for them.

Now that Mr. Pitelka has raised the question of the time unit I hope others will join in the discussion. We do need an agreed standard.

R. E. MOREAU

*East African Agricultural Research Station
Amani, Tanganyika Territory*

November 8, 1942

EDITOR OF "THE AUK":—

In the discussion of time units to which Mr. R. E. Moreau refers (Auk, 58: 611, 1941), two separate issues are involved: first, the basic unit to be used in expressing rates of feeding and, second, the minimum acceptable observation period. In my allusion to Mr. Moreau's use of the 200-minute unit, I did not differentiate clearly between them. Mr. Moreau used 200 minutes as a basic unit to express feeding rate. My reference to a "longer period" concerned the length of the observation period, not the basic unit; and I incorrectly imply that Mr. Moreau's observation periods lasted 200 minutes, when actually each period within any one day lasted five hours or more. The basic unit and the minimum observation period may now be discussed separately.

(1) By "hour unit" I mean actually a *unit of one hour*. This is apparent in the suggested tabulation of feeding data on page 610, where I mention "number of visits per hour." A unit of one hour has been used and is being used by many students of breeding behavior to express feeding rate. Moreover, by using the hour unit (*vs.* a larger unit as 200 minutes or $3 \frac{1}{3}$ hours), one can detect directly changes from hour to hour and speak of diurnal variation in terms of that same unit.

Mr. Moreau points out that in selecting a 200-minute period as a unit, he would be able to express rates for slowest-feeding species as greater than 1. I see no objection to expressing feeding rate for a slow-feeding species as a decimal figure using the unit of one hour. I would rather read, e.g., .5 feedings per hour than 1.7 feedings per 200 minutes. This, I think, is based on more than personal preference. In addition to convenience and the fact that "'per hour' . . . tends to be in back of everyone's mind," there are other reasons for using the hour unit: Two have been mentioned above; and we may agree, finally, that the hour unit is the simpler and the least likely to cause any confusion.

(2) With regard to the minimum acceptable observation period, my earlier statement was that "observations should extend over at least 5-8 hours." This, as Mr. Moreau emphasizes above, is a *continuous* period of observation within any one day. The recommendation on this point may be stated as follows: *When the observer seeks numerical data on feeding and attentiveness, his minimum period of continuous observation within any one day should be five hours.* But exceptions may be made occasionally; thus, if the species in question is a rapid feeder, the observer may prefer to sample feeding rates for two- or three-hour periods at different times of day.

FRANK A. PITELKA

Museum of Vertebrate Zoology
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CORRIGENDA

In Vol. 59, No. 4, October, 1942:

P. 568, l. 26: For "any," read "many".

P. 568, l. 41: For "ship," read "ships".

P. 570: delete line 16 and insert: "him and Abbot himself was in the habit of retouching the work that".

P. 592, l. 22: For "nineteenth," read "fourteenth".

OBITUARIES

MYRON HARMON SWENK, an Associate of the American Ornithologists' Union from 1904, and a Member from 1920, was born at Polo, Illinois, August 8, 1883, and died at Lincoln, Nebraska, July 17, 1941. The Nebraska Bird Review, Volume 10, No. 1, January-June (July 7) 1942, designated on the title page as the 'Myron Harmon Swenk Memorial Issue,' contains a portrait, a biography by Harry C. Oberholser (pp. 1-6), a bibliography by H. Douglas Tate (pp. 6-15), and an article by Myron H. Swenk and Edson Fichter on the 'Distribution and Migration of the Solitary Sandpiper in Nebraska' (pp. 15-22). Obituaries prepared by Dr. Tate have been published also in The Journal of Wildlife Management, 6 (1): 95-96, Jan., 1942, and in The Journal of Economic Entomology, 34 (6): 863-864, Dec., 1941, with portrait.—W. L. McATEE.

EDWIN ASHBY, a Corresponding Fellow of the American Ornithologists' Union since 1918, died at his home, Wittunga, Blackwood, about eight miles from Adelaide, South Australia, January 8, 1941. He had recently passed his 79th birthday, having been born November 2, 1861, at Plaistow near Capel, Sussex, England. At the age of 23 he went to South Australia where he engaged in business as a land and estate agent but retired while still a comparatively young man. When he took up his residence in Australia he was in rather delicate health but his interest in natural history, his activities in an outdoor life and travel in various parts of the country in search of specimens, did much to improve his health. In 1918 while on a world tour he visited Washington and spent some time working in the U. S. National Museum where he met several American ornithologists. It was at this time that he was elected a Corresponding Fellow of the A.O.U. He was also a Life Member of the British Ornithologists' Union, a Fellow of the Linnean Society of London and a Foundation Member of the South Australian Ornithological Association.

Ashby's publications on birds, according to a list which appeared in 'The Emu,' numbered 81 titles, about two-thirds of which were contributed to 'The Emu' and one-third to 'The South Australian Ornithologist.' He published 'Notes on the Mound-building Birds of Australia' in 'The Ibis' for 1922 and an interesting article on the same subject in 'The Auk' for 1929. He described several new species of Australian birds including the Desert Chat or Gibber-bird (*Ephthianura lovensis*) which was later made the type of a new genus *Ashbyia* by A. J. North. In the summer of 1935 about two-thirds of his collection of birds was burned in a fire which destroyed his home.

Ashby was an all-round naturalist and made notable contributions to conchology and horticulture as well as ornithology. He published about 40 papers on shells and was an authority on the Chitons, a peculiar group of mollusks. In later years he became much interested in botany and horticulture. At his home he brought together a unique collection of native and exotic shrubs and did everything possible to encourage the cultivation of native Australian species.

He had a genial and charming personality and an enthusiasm that was contagious. He made friends readily and all through life encouraged younger men in the study of birds and nature. A more extended notice of his activities, accompanied by a portrait and a bibliography of his ornithological publications, may be found in 'The Emu' for July, 1941, pp. 409-413.—T. S. PALMER.

GEORGE LATIMER BATES, a Corresponding Fellow of the American Ornithologists' Union since 1919, died in Chelmsford, England, January 31, 1940, in his 77th year. During the previous autumn he had undergone a serious operation from which he never fully recovered. He was the eldest son in a large family and was born in Abingdon, Illinois, March 21, 1883, but spent most of his life abroad. He graduated from Knox College in Galesburg in 1895 and the Theological College in Chicago in 1891. Later his alma mater conferred on him the degree of LL.D. His father wished him to enter the ministry but the son, actuated by a deep interest in natural history which he inherited from his mother, and a strong desire to travel, persuaded his father to send him abroad. In 1895 he went to West Africa, working at first in Gabon and the French Congo and in later years in the Cameroon. In 1905, after a visit to his home in America, he settled at Bitye (native name for Bates), on the Ja River in Cameroon, where he engaged in agriculture, raising cacao, coffee, rubber and potatoes. After 1923 he made expeditions to various parts of West Africa and in 1934 a trip to Jidda, Arabia. In 1896 he began making natural history collections which he sent to the British Museum at intervals during a period of about thirty years. He was an excellent field collector and made many interesting discoveries in mammals, birds and reptiles, his collections in reptiles alone including 62 new species. His fishes and plants were considered "models of careful collecting." About 1929 he returned to England and settled at Little Waltham, near Chelmsford, which became his home for the remainder of his life.

Bates's publications on birds numbered about 30 and appeared mainly in 'The Ibis' from 1904 to 1938. The most important were: 'The Birds of the Efulen District in Cameroon,' 'Birds collected in Northwestern Cameroon,' 'Birds of Cameroon and Lake Chad Region,' 'Birds of the southern Sahara and adjoining countries in French West Africa,' 'On Geographical Variation within the Limits of West Africa' and the 'Birds of Jidda and central Arabia.' In 1914 he published 'Some Facts bearing on the affinities of *Smithornis*' showing that it did not belong in the Passeres, a fact later confirmed by P. R. Lowe who proved that it belonged to the *Eurylaemidae*. In 1918 he published an important paper on 'The Reversed Under Wing-coverts of Birds and their Modifications,' a subject in which he was much interested. In 1930 appeared his 'Handbook on the Birds of West Africa' and at his death he left an unpublished manuscript on the 'Birds of Arabia.'

As a boy, Bates was naturally shy and retiring, and these traits were increased by long years of residence abroad, but he was always willing to help others. Though well informed on many subjects, he rarely spoke at meetings of the British Ornithologists' Club. A more extended account of his work and a bibliography of his publications, by N. B. Kinnear, may be found in 'The Ibis' for April 1940, pp. 343-346.—T. S. PALMER.

MRS. HAROLD HULME BRINDLEY of Cambridge, England, better known to ornithologists under her maiden name of Maud Doria Haviland, a Corresponding Fellow of the American Ornithologists' Union since 1920, died April 3, 1941. She was born at Tamworth, Warwickshire, England, February 10, 1889, and was the great-granddaughter of Dr. John Haviland, Lord of the Manor of Fen Ditton, Cambridge, and Fellow of St. John's College, Cambridge. It is recorded that her school days "were passed mainly on the estate of her stepfather in southeast Ireland, where she became a good game-shot and had wide opportunities for observing birds, the dominating passion of her life." In 1913 she published 'Wild Life on the Wing,' and about the same time two other books of animal stories for children.

In the spring of 1914 she accompanied Miss Czaplicka, the Polish anthropologist, Miss Dora Curtis and Mr. H. V. Hall on a trip down the Yenesei River in Siberia. The members of the expedition traveled overland to Krasnoyarsk, on the Trans-Siberian Railway, at the crossing of the Yenesei River. There they took a steamer down the river about 1500 miles to Golchika, near the mouth, thus following part of the route traversed by Henry Seebohm in 1877 as described in his 'Siberia in Asia.' After spending the summer at Golchika, they returned through the Kara Sea and around the North Cape, reaching England about the time of the outbreak of the World War. Miss Haviland's account of her experiences, entitled 'A Summer on the Yenesei' (1915), should be read in connection with Seebohm's earlier work. In the following years she was elected an Honorary Lady Member of the British Ornithologists' Union.

In 1917, Miss Haviland, as a member of the Scottish Women's Hospital, served as chauffeur to Dr. Elsie Inglis, in Roumania, and the next year as a chauffeur under the French Red Cross in the Soissons-Paris region. Soon after the war she took up residence at Cambridge, attended the Tripos courses in Zoology and began her studies of the Hemiptera-Heteroptera, a group of insects in which she was especially interested. In the early part of 1922, under a grant from the Royal Society and the Cambridge Zoological Laboratory, she made investigations on the Mazaruni and Demerara rivers in British Guiana on the Hemiptera-Heteroptera injurious to vegetation. The results of these investigations were published by the Royal Society.

Toward the close of the same year, on December 11, 1922, she married Harold Hulme Brindley, Fellow of St. John's College. Two years later she gave a course of lectures to the Tripos class on 'Forest, Steppe and Tundra,' a course which was subsequently published by the Cambridge Press. Mrs. Brindley was an active member of the Cambridge Bird Club, a founder and chairman of the Executive Committee of the Cambridge Sanctuary Club, and Vice-President and Honorary Treasurer of the Cambridge branch of the Society for the Preservation of Rural England.—T. S. PALMER.

DR. FRIEDRICH STEINBACHER, elected a Corresponding Fellow of the American Ornithologists' Union in 1934, died February 15, 1938, in the 61st year of his age. Born in Berlin, Germany, June 4, 1877, he was primarily a mathematician and by profession a teacher of mathematics and biology. Not until middle life did he develop an active interest in ornithology when, in 1920, he joined the Deutsche Ornithologische Gesellschaft. Six years later he became Vice-President, and in 1936 President of the D.O.G., a position which he held at the time of his death. He was especially interested in the broader problems of the ornithology of the Palaearctic region. Dr. Steinbacher took an active part in the International Ornithological Congresses held at Copenhagen, Amsterdam and Oxford, and assisted the late Dr. Ernst Hartert in the preparation of the 'Proceedings of the Sixth International Congress' at Copenhagen in 1926. He will be remembered by ornithologists chiefly for his work as assistant to Dr. Hartert and later as editor of the Supplement to Hartert's great work 'Die Vögel der Paläarktischen Fauna.'—T. S. PALMER.

EMMA LOUISA TURNER, a Corresponding Fellow of the American Ornithologists' Union since 1920, died in Cambridge, England, August 14, 1940, at the age of 74.

She was a pioneer in bird photography and for the high quality of her work was awarded the gold medal of the Royal Photographic Society. Among other pictures, she secured in 1911 photographs of the first young bitterns known to have been hatched in Norfolk since the return of the species to that region. Her pictures were largely made in Norfolk where she had a house boat on Hickling Broad. Here she made the observations as well as photographs which formed the basis of her book on 'Broadland Birds.' In 1923 she was appointed a watcher of the National Trust on Scolt Head Island, where she remained eighteen months, and from her lonely hut secured the material for her book on 'Bird Watching on Scolt Head.'

Miss Turner was a member of the Cambridge Bird Club, one of the first women to be elected a Fellow of the Linnean Society and one of the first Honorary Lady Members of the British Ornithologists' Union. Her interests were by no means confined to her chief hobby 'bird watching.' She possessed a keen sense of humor, indomitable energy and pluck and a broad appreciation of beauty, and cultivated beautiful gardens at her houses in Girton and Cambridge. She was a keen reader and was described as a woman of kindness and sympathy, much interested in the welfare of her friends. In the last two years of her life she suffered the loss of her sight, but even this affliction failed to diminish her courage or lessen her interest in birds and other things about her.—T. S. PALMER.

CHARLES KETCHAM AVERILL, a former Associate of the American Ornithologists' Union, died at Bridgeport, Connecticut, February 18, 1942, in his eighty-fifth year. He was born in Brooklyn, New York, August 21, 1857. During his boyhood his family moved to Bridgeport, and he resided there for the remainder of his life. He was educated at the Sheffield Scientific School of Yale University and followed the profession of civil engineering.

During the late nineteenth century the Bridgeport Scientific Society was a flourishing organization and Mr. Averill one of its active members, particularly in the fields of ornithology and botany. The society amassed collections of natural history objects and sponsored a series of lectures open to the public and well attended by them. Mr. Averill obtained many of the bird skins in the collection, and delivered a number of the lectures on ornithology.

His publications on ornithology came in two distinct periods. Between 1884 and 1892 he published a number of short articles, first in 'The Ornithologist and Oölogist' and later in 'The Auk.' Each of these was a distinct contribution to our knowledge of the occurrence or behavior of Connecticut birds. These papers terminated in a 'List of Birds found in the vicinity of Bridgeport, Conn.,' which was published by the Bridgeport Scientific Society.

In the period from 1920 to 1927 Mr. Averill published a series of papers in 'The Auk' and 'The Condor,' showing relationship between certain physical characters or measurements of birds, and their migrations, distribution and nesting habits. In addition to his ornithological work he made many contributions to botanical science. A state publication on the ferns and flowering plants of Connecticut contains many references to his finds.

He was a friendly man with a pleasant personality and was always scrupulously careful as to the accuracy of his scientific work. He possessed that which, according to popular belief, a scientist is not supposed to have,—a great love and appreciation for all the beauties of nature.—ARETAS A. SAUNDERS.

In the sudden death of HENRY CORBIN FULLER, on August 26, 1942, at New Haven, Conn., as he was returning to his home in Washington, the Union has lost a worthy Associate and the nature lovers in the Capital a devoted companion. He was born November 13, 1879, at Worcester, Mass., where he also obtained his basic education in chemistry at the Worcester Polytechnic Institute. After graduating in 1901, he was engaged in chemical work with commercial houses, analyzing drugs and chemicals used in the production of medicine. Later he entered the U. S. Department of Agriculture as chemist under Dr. Harvey W. Wiley, to whom he lovingly referred as his mentor, working on the problems incident to the Food and Drug Act of 1906. He assisted Doctor Wiley on his pure-food research for 'Good House-keeping' published in 1914, by doing much of the analytical work.

During the period covered by the World War, he was with the Institute of Industrial Research, at the same time supervising drug propagation on a commercial scale, and managing a drug farm in Virginia, where digitalis and other important medicinal plants were grown.

He published three books on chemistry and a number of shorter papers on the subject. His most notable work, 'The Chemistry and Analysis of Drugs and Medicine,' containing 1,072 pages, appeared in 1920.

He was an Associate of the American Ornithologists' Union, member of the Washington Biologists' Field Club, Baird Ornithological Club, Washington Academy of Sciences, Cosmos Club, and a number of chemical societies. In an avocational way, he was a philatelist of note and had a collection of 27,000 stamps, representing about one-fourth of all varieties of stamps ever issued. Although interested in all wildlife, his pet avocation was ornithology, and he lost no opportunity to watch and study birds in their natural haunts. Nothing gave him a greater thrill than when he ran upon a bird new to him in life. The writer recalls one trip, especially, that Fuller made with him through the West to the Pacific States and British Columbia, and every possible opportunity was taken to broaden his view of the wilder country and its animal and plant life. It proved to be one of the most memorable and enjoyable of Fuller's experiences.

As a well-known chemist and nature lover, with his easy and cordial manner of approach, Fuller had a wide and varied acquaintance, especially among kindred spirits whose interests were similar to his. He was a man of good breeding, with a fine sense of honor and had strict regard for his obligations and high consideration for the rights and feelings of others. He was, in short, a gentleman, whom we all shall sorely miss.

He is survived by his widow; a son, Henry Shepard Fuller, M.D.; and two daughters, Mrs. Thomas Watson and Miss Josepha Fuller.—A. K. FISHER.

ALVAH HENRY BEDELL JORDAN, an Associate of the American Ornithologists' Union since 1888 and an Honorary Life Associate since 1928, died in his 77th year at Everett, Washington, May 31, 1942. He was born in Boston, Massachusetts, September 23, 1865, and was descended from a Colonial family which came to America in 1639. He became an apprentice in a wood-pulp company at the age of 16, and in 1895 went out to the Pacific Northwest, settled at Everett, Washington, and became one of the founders of the Everett Pulp and Paper Company.

Jordan had a broad interest in birds, especially game birds, but apparently published little. He served on the Board of Game Commissioners of Snohomish County for a number of years and as President of the Board of Regents of the University of Washington for six or seven years. In addition to his membership in the

American Ornithologists' Union, he had been a member of the Cooper Ornithological Club since 1911 and was a prominent member of the Pacific Bird and Mammal Society of which he was made a Life Member in 1930.—T. S. PALMER.

FRITZ SARASIN, the well-known Swiss explorer and naturalist, died in March, 1942, at the age of 82 years. Together with his cousin, Paul Sarasin, he undertook a number of important explorations to Ceylon, Celebes and New Caledonia, and published extensive monographs on his results. Among many discoveries were *Myza sarasinorum*, *Zosterops chlorates sarasinorum*, and *Phylloscopus trivirgatus sarasinorum*. Sarasin is the author of the only comprehensive account of the bird fauna of New Caledonia and the Loyalty Islands. A fuller biographical account will be found in the 32nd Jahrb. Schweiz. Ges. Urgeschichte, pp. 14-16.—ERNST MAYR.

NOTES AND NEWS

THE COUNCIL of the American Ornithologists' Union has directed that a list be prepared and published in an early issue of 'The Auk' of all members of the A. O. U. in War Service. It is requested that you forward at once to the Secretary the name, address, rank, and division of service of every A. O. U. member whom you know to be serving in the cause of the United Nations.

THE SIXTIETH STATED MEETING OF THE
AMERICAN ORNITHOLOGISTS' UNION

BY LAWRENCE E. HICKS

THE eighth meeting to be held in Philadelphia took place October 12-16, 1942. Headquarters were at the Hotel Warwick and most of the business sessions were held there. The public sessions were held in the auditorium of the Philadelphia Academy of Sciences.

Business Sessions.—The meetings on Monday, October 12, included two sessions of the Council, a meeting of the Fellows at 4 p. m. and a meeting of the Fellows and Members at 8 p. m. The evening business session was attended by 16 Fellows and 19 Members—a total of 35 present.

There were elected three Fellows, five Members, and 181 Associates. On November 15, 1942, vacancies in the various membership classes were as follows: Fellows, 1; Honorary Fellows, 5; Corresponding Fellows, 23; Members, 16.

The Treasurer's report was accepted and the meeting authorized the Finance Committee (acting without the Treasurer) to review and approve the final audited reports of the Treasurer and of the Board of Trustees.

The Treasurer commented on each item of expense that had increased or decreased as compared with the previous year. Various economy and efficiency measures during the past three years had disposed of nearly all outstanding obligations and given the A. O. U. a balanced budget. The returns from the Endowment Campaign, though not large, were quite satisfactory, and promised to be augmented by future gifts. In addition the campaign had resulted in the taking out of a half-dozen life memberships and several gifts, including a contribution of \$3000, distributed over a five year period, by Edward A. McIlhenny, toward publication of 'The Auk.' The Trustees' Report showed that the Endowment Funds, totalling \$31,175.48, were in good condition.

The Secretary's report indicated that on September 30, 1942, the paid-up members of the Union were as follows: Associates, 1,293; Members, 133; Fellows, 47; Patrons, 3; Emeritus Fellows, 1; Honorary Fellows, 23; Associate-elects, 93. Total, including 80 Corresponding Fellows, 1,586. In addition there were 176 subscribers. Fifty-six resignations had been accepted during the year and 181 Associates elected. Roll call was held for the 26 members deceased since the last

meeting: 3 Fellows, 1 Honorary Fellow, 1 Corresponding Fellow, 6 Members and 15 Associates.

The retiring members of the Council (Ludlow Griscom, Alden H. Miller and P. A. Taverner) were replaced for three-year terms by Arthur A. Allen, Rodolphe M. deSchauensee and Robert C. Murphy. Rudyard Boulton was elected to the Council for two years to fill out an unexpired term. The new officers elected were as follows: President, James L. Peters; Vice-Presidents, George Willett and Hoyes Lloyd; Secretary, Lawrence E. Hicks; Treasurer, J. Fletcher Street.

A new amendment to the By-Laws, first proposed at the 1941 meeting, was given final and favorable action. This makes a change in Sec. 7, Art. VII to permit proposals for the class of Associates to be made to the Council through the Secretary by members of any class, including Associates. A second amendment, up for final action and which would have combined the two classes of Honorary and Corresponding Fellows, was tabled.

The Council voted to limit each edition of 'The Auk' to 300 copies in excess of current needs and to use no color plates in 'The Auk' in 1943 unless contributed.

The 1942 award of the Brewster Medal was made to Mrs. Margaret M. Nice in recognition of her publication on "Life History of the Song Sparrow."

George H. Stuart, 3rd, was re-elected Chairman of the Board of Trustees and the two vacancies created through the resignation of Mr. Riker and Mr. Gregory, were filled by the election of Julian K. Potter and James Savage.

The Union voted to accept the report of the Committee on Bird Protection (Victor Cahalane, William Finley, Clarence Cottam and Aldo Leopold). The full report appears in 'The Auk.'

The Council voted to have a list prepared of all A. O. U. members in War Service. Members are urged to forward to the Secretary at the earliest possible date full data on each man in the Service, so that a list can be published in an early issue of 'The Auk.'

The Council also instructed the Treasurer not to drop members for non-payment of dues who are in the War Service of the United Nations.

The Union adopted the report of the Resolutions Committee (A. A. Allen, Pierce Brodkorb and H. G. Deignan). This report read as follows:

Whereas the American Ornithologists' Union at its 60th stated meeting has received the most gracious hospitality and thoughtful

attentions from the Academy of Natural Sciences and from the Delaware Valley Ornithological Club, be it resolved that we hereby express our most sincere thanks and appreciation to the President of the Academy of Natural Sciences, Mr. Charles M. B. Cadwalader, for the use of the halls and all the facilities of the Academy for our meetings and to Mr. R. M. deSchauensee, the General Chairman of Arrangements, for his thoughtful planning for all the needs and conveniences of the Union at this meeting, and at the same time to offer them our congratulations upon the completion of the most attractive and original educational exhibits in Audubon Hall of the Academy; and be it further resolved that we express our appreciation to Mr. Henry T. Underdown and his Committee, John A. Gillespie, Charles Mohr, James Rehn and Edward S. Weyl, for their part in providing for the smooth and orderly arrangements which have contributed so much to the success of this meeting; and to Charles Mohr and his Committee of Joseph Cadbury, P. A. Livingston, Norman McDonald and Richard Pough, for their efforts in our behalf in arranging the interesting field trips to the Zoological Park and to the Witmer Stone Wildlife Sanctuary at Cape May; and to Freeman M. Shelly, the Director of the Philadelphia Zoological Society and Roger Conant, Curator, for the courtesies extended to the Union. And especially would we extend our thanks to James Bond and his Committee of Horace Groskin, J. Fletcher Street, George Stuart, 3rd, and Edward Woolman, for their careful planning of the entertainment at the buffet supper and the Annual Dinner, and to Mr. Richard E. Bishop for showing us his remarkable ultra-speed films of game birds in action.

Furthermore, we would express our appreciation to McCready Huston and his Committee on Publicity of P. A. Livingston and Julian K. Potter, for the dignified notices of the meeting which have been given to the press, to Mr. Cary Livingston for his untiring attentions to those members of the Union working in the bird room and to Mrs. Arthur Emlen for the loan of the material for the exhibit of memorabilia of Witmer Stone.

Public Meetings.—The public meetings opened on Tuesday morning with an address of welcome by Charles M. B. Cadwalader, President of the Academy of Natural Sciences, and a response by acting President James L. Peters. The program included 26 papers, five of which were read by title, and as usual covered a wide range of subjects, both popular and technical. Classified as to content the papers covered the following subjects: distribution and migration, 8; life history, 7; behavior, 5; anatomy and physiology, 4; faunal, 3; tax-

onomic, 3; bird banding, 2; bird song, 2; biography, 2; conservation or education, 2; populations, 2; techniques, 2; exploration, 1; nomenclature, 1; waterfowl, 1.

Social Events.—On Tuesday evening 146 persons attended a buffet supper and an open house at the Philadelphia Academy of Sciences. This event afforded a welcome opportunity for visits with friends while reviewing the interesting vertebrate collections and educational exhibits. Wednesday evening was occupied by the annual dinner at the Academy with 130 present. The highlight of the evening was an address by the "Argentinian Ambassador," impersonated by a local resident. Fewer than a baker's dozen failed to be "taken in" by his skilled performance. After some contests arranged by the local committee, some splendid color films were shown by Richard E. Bishop of Philadelphia. They included some unusual slow-motion shots of game birds. Wednesday noon a group photograph was taken of the 62 members present at that time.

Excursions.—Thursday afternoon a party of 48 took the train to Cape May, New Jersey. The evening was spent at the Hotel Macomber listening to an illustrated review of the natural history of the Witmer Stone Sanctuary area by Richard Pough, and bird-song imitations and color films of the southern Audubon refuges, presented by Allan Cruikshank. During the last seven years Christmas Censuses at Cape May averaged 107 species. Most members are well acquainted with the amazing concentrations of migrating birds which suitable combinations of weather and wind conditions may bring about near the water surrounding the Cape May tip of the New Jersey peninsula.

The A. O. U. party proved to be a group of enthusiastic observers, being stationed at various key positions by daybreak, in spite of an early drizzling rain. Few new bird arrivals came in, but the bird list of those present grew to at least 85 by train time in mid-afternoon. Many thousands of Tree Swallows, and more than sixty large flocks of White-winged Scoters were recorded, in addition to several groups of Canada Geese, Little Blue Herons, Willets, Plover, Sandpipers, Laughing and Great Black-backed Gulls and Myrtle Warblers. Many of the visitors were thrilled by excellent views of occasional Pigeon Hawks, Duck Hawks, or Ospreys.

THE PROGRAM

Papers are arranged in the order in which they were presented at the meeting. Starred papers were illustrated by lantern slides; those with a double star were illustrated by motion pictures.

TUESDAY MORNING

Welcome by CHARLES M. B. CADWALADER, President of the Academy of Natural Sciences.

Response by JAMES L. PETERS, Vice-President, American Ornithologists' Union.

Roll Call of Fellows and Members, Report of the Business Meeting, Announcement of the Result of Elections.

Report of the Local Committee on Arrangements. R. MEYER DESCHAUENSEE.

1. A Hawk Migration Along the North Shore of Lake Erie. W. E. SAUNDERS, London, Ontario.
2. Changes in Bird Life of the Northeastern States During the Last Twenty-five Years. LUDLOW GRISCOM, Museum of Comparative Zoölogy, Cambridge, Massachusetts.
3. Inconsistencies of Vernacular Bird Names. ROGER TORY PETERSON, National Audubon Society, New York City.
4. The Summer Cessation of Bird Song. ARETAS A. SAUNDERS, Fairfield, Connecticut.
5. In Memoriam: JOSEPH HARVEY RILEY. (Read by title.) ALEXANDER WETMORE, U. S. National Museum, Washington, D. C.

TUESDAY AFTERNOON

6. The Vanishing Ivory-bill. BAYARD H. CHRISTY, Sewickley, Pennsylvania.
7. Warbler Songs, Illustrated with Phonograph Records. ARTHUR A. ALLEN, Cornell University, Ithaca, New York.
8. *Further Notes and Observations on the Pileated Woodpecker. J. SOUTHGATE Y. HOYT, U. S. Army, Charleston, South Carolina.
9. **A New Source of Ornithological Interest. ALEXANDER SPRUNT, JR., Charleston, South Carolina.
10. Winter Returns of Slate-colored Juncos at Norristown, Pennsylvania. RAYMOND J. MIDDLETON, Norristown, Pennsylvania.
11. **Purple Sandpipers on the Massachusetts Coast and an Unusual Nesting of the Duck Hawk. (Read by title.) JOHN B. MAY, Cohasset, Massachusetts.

WEDNESDAY MORNING

12. Observations on Molting in Captive Falcons. (Exhibit of live Hawks—Duck Hawk, Pigeon Hawk and Goshawk.) ROBERT M. STABLER, Department of Zoology, University of Pennsylvania, Philadelphia, Pennsylvania.
13. The First Recorded Observation on Bird Migration in America. T. S. PALMER, Washington, D. C.
14. The New Species of Birds Described in 1938-1941. JOHN T. ZIMMER and ERNST MAYR, American Museum of Natural History, New York City.
15. *Notes on Bird Protection in Latin America. T. GILBERT PEARSON, International Committee for Bird Protection, New York City.
16. **Through the Year with the Pileated Woodpecker—Exhibition of Live Woodpecker. J. SOUTHGATE Y. HOYT, U. S. Army, Charleston, South Carolina.
17. **Grebbs and Gadwalls. CLEVELAND P. GRANT, Covington, Kentucky.
18. In Memoriam: CLINTON HART MERRIAM. (Read by title.) T. S. PALMER, Washington, D. C.

THURSDAY MORNING

19. Variation in Post-juvenal Wing Molt and Outermost Primary Covert Structure in the Galliformes; a Preliminary Report. GEORGE A. PETRIDES, National Park Service, Washington, D. C.
20. Winter Returns From Banded Tree Sparrows. RAYMOND J. MIDDLETON, Norristown, Pennsylvania.
21. *Ravens in the Shenandoah National Park. W. BRYANT TYRRELL, Takoma Park, Maryland.
22. *The Changing Abundance of Birds in Central New York State. ARTHUR A. ALLEN, Cornell University, Ithaca, New York.
23. Climatic Change and Bird Distribution. DEAN AMADON, American Museum of Natural History, New York City.
24. The Generic Classification of the Swallow Family. ERNST MAYR, American Museum of Natural History, New York City, and JAMES BOND, Academy of Natural Sciences, Philadelphia.
25. **Common Birds of Maine. (Read by title.) ALFRED O. GROSS, Bowdoin College, Brunswick, Maine.
26. Further Observations on Swainson's Warbler in West Virginia. (Read by title.) MAURICE BROOKS, West Virginia University, Morgantown, West Virginia.

ATTENDANCE

The 1942 meeting, the eighth to be held in the Philadelphia area, had a registered attendance of 102 members (all classes) and 90 visitors—a total of 192. The list of those present in 1942 included 1 Honorary Fellow, 18 Fellows, 21 Members and 62 Associates.

Members were present from 19 States and Provinces. Sixty-two members and 26 visitors registered from localities outside of Pennsylvania. Exclusive of visitors the 5 largest delegations were; Pennsylvania, 40; New York, 17; Washington, D. C., 12; New Jersey, 7; and Ohio, 4.

The 7 members traveling the greatest distances were: Charles A. Harwell, Berkeley, California; George Willett, Los Angeles, California; Elizabeth A. Oehlenschlaeger, Milwaukee, Wisconsin; Jules A. Decarie, Montreal, Quebec; R. Allyn Moser, Omaha, Nebraska; Hoyes Lloyd, Ottawa; and W. E. Saunders, London, Ontario.

CALIFORNIA, 2—*Fellow*, George Willett, Los Angeles. *Associate*, Charles A. Harwell, Berkeley.

CONNECTICUT, 1—*Member*, Aretas A. Saunders, Fairfield.

KENTUCKY, 1—*Associate*, Cleveland P. Grant, Covington.

MARYLAND, 3—*Associates*, Gorman M. Bond, Elkridge; C. Haven Kolb, Baltimore; W. Bryant Tyrrell, Takoma Park.

MASSACHUSETTS, 3—*Fellows*, A. C. Bent, Taunton; Ludlow Griscom, James L. Peters, Cambridge.

MICHIGAN, 2—*Fellow*, J. Van Tyne, Ann Arbor. *Member*, Pierce Brodkorb, Ann Arbor.

- MISSISSIPPI, 1—*Associate*, M. L. Miles, Vicksburg.
- NEBRASKA, 1—*Associate*, R. Allyn Moser, Omaha.
- NEW JERSEY, 7—*Members*, B. S. Bowdish, Demarest; Charles H. Rogers, Princeton. *Associates*, Dorothy M. Compton, Princeton; Robert L. Haines, Merchantville; Edward R. Manners, Westville; Julian K. Potter, Collingswood; Richard H. Pough, Cape May.
- NEW YORK, 17—*Honorary Fellow*, Jean T. Delacour, New York City; *Fellows*, Arthur A. Allen, Ithaca; Robert C. Murphy, John T. Zimmer, New York City. *Members*, Lee S. Crandall, John T. Nichols, T. Gilbert Pearson, Roger T. Peterson, New York City; James Savage, Buffalo; Dayton Stoner, Albany. *Associates*, Dean Amadon, Carl Buchheister, Ruth T. Chapin, Allan D. Cruickshank, Eugene Eisenmann, New York City; Robert A. Johnson, Oneonta; Theodora Nelson, New York City.
- OHIO, 4—*Fellow*, Lawrence E. Hicks, Columbus. *Associates*, Robert J. Lebrecht, Columbus; Harold Mayfield, Toledo; George A. Smith, Cuyahoga Falls.
- ONTARIO, 2—*Fellows*, Hoyes Lloyd, Ottawa; W. E. Saunders, London.
- PENNSYLVANIA, 40—*Fellows*, W. E. Clyde Todd, Pittsburgh; Rodolphe M. deSchauensee, Devon. *Members*, William L. Baily, Haverford; James Bond, Philadelphia; Bayard H. Christy, Sewickley; Francis Harper, Swarthmore; J. Fletcher Street, Philadelphia; George H. Stuart, 3rd, Villa Nova. *Associates*, Francis L. Bacon, Chestnut Hill; Joseph M. Cadbury, Hampton L. Carson, Philadelphia; J. Frank Cassel, Wyomissing; Mrs. Francis H. Coffin, Scranton; Victor A. Debes, Prospect Park; George J. Free, State College; Walter A. Freyburger, Upper Darby; John A. Gillespie, Glenolden; Morris M. Green, Ardmore; Frances L. Groff, West Chester; Horace Groskin, Ardmore; Frederick V. Hebard, Philadelphia; Horace D. McCann, Paoli; Norman J. McDonald, Philadelphia; Philip P. Malley, Coatesville; Raymond J. Middleton, Norristown; Charles E. Mohr, Philadelphia; Edwin T. Moul, York; Mrs. T. F. Price, Huntingdon; George W. Pyle, Paoli; James A. G. Rehn, Philadelphia; William E. Roberts, Lansdowne; William J. Serrill, Haverford; Robert M. Stabler, Glen Mills; William S. Tallman, Jr., Sewickley; Samuel A. Tatnall, Philadelphia; John E. Trainer, Allentown; Harry T. Underdown, Elkins Park; Edward S. Weyl, Philadelphia; Harold B. Wood, Harrisburg; Edward Woolman, Haverford.
- QUEBEC, 1—*Associate*, Jules A. Decarie, Montreal.
- SOUTH CAROLINA, 2—*Member*, Alexander Sprunt, Charleston. *Associate*, J. Southgate Y. Hoyt, Charleston.
- VERMONT, 1—*Member*, Wendell P. Smith, Wells River.
- WASHINGTON, D. C., 12—*Fellows*, Herbert Friedmann, Frederick C. Lincoln, T. S. Palmer, Edward A. Preble, Alexander Wetmore. *Members*, John W. Aldrich, H. G. Deignan, S. Dillon Ripley. *Associates*, Phillip F. Allan, Charles H. M. Bartlett, Malcolm Davis, R. Bruce Horsfall.
- WEST VIRGINIA, 1—*Associate*, J. Floyd Poland, Martinsburg.
- WISCONSIN, 1—*Associate*, Elizabeth A. Oehlenschlaeger, Milwaukee.

ELECTION OF OFFICERS

The election of officers for 1942 resulted as follows: *President*, James L. Peters; *Vice-Presidents*, George Willett and Hoyes Lloyd; *Secretary*, Lawrence E. Hicks; *Treasurer*, J. Fletcher Street. *Members of the Council* (in addition to officers and ex-presidents) for three years,

Arthur A. Allen, Rodolphe M. deSchauensee and Robert C. Murphy; for two years, Rudyerd Boulton.

The Council elected John T. Zimmer Editor of 'The Auk'; J. Fletcher Street, Business Manager; George H. Stuart, 3rd, Julian K. Potter and James Savage, Trustees; and James L. Peters, J. Fletcher Street, Rudyerd Boulton, Lawrence E. Hicks and Ludlow Griscom, members of the Finance Committee.

ELECTION OF FELLOWS, MEMBERS AND ASSOCIATES

FELLOWS, 3—Dr. Clarence Cottam, Washington, D. C.; Rodolphe M. deSchauensee, Philadelphia, Pennsylvania; and Dr. Harrison F. Lewis, Ottawa, Canada.

MEMBERS, 5—Earle R. Greene, Key West, Florida; Harry W. Hann, Ann Arbor, Michigan; Robert C. Miller, San Francisco, California; Earle L. Poole, Reading, Pennsylvania; S. Dillon Ripley, Litchfield, Connecticut.

ASSOCIATES, 181—The names of the Associates who qualify will appear in the membership list published in this issue of 'The Auk.'

DECEASED MEMBERS

During the year the Union lost 26 members by death: 3 Fellows, 1 Honorary Fellow, 1 Corresponding Fellow, 6 Members and 15 Associates.

WILLIAM PLANE PYCRAFT, Honorary Fellow (1902), aged 74, died at London, England, May 1, 1942.

MRS. HAROLD HULME BRINDLEY, Corresponding Fellow (1920), aged 52, died at Cambridge, England, April 3, 1941.

DR. GLOVER MORRILL ALLEN, Fellow (1896), aged 63, died at Cambridge, Massachusetts, February 14, 1942.

DR. CLINTON HART MERRIAM, Founder, Patron, Life Fellow and Ex-President, aged 86, died at Berkeley, California, March 19, 1942.

JOSEPH HARVEY RILEY, Fellow (1897), aged 68, died at Falls Church, Virginia, December 17, 1941.

VERNON ORLANDO BAILEY, Member (1887), died in his 78th year at Washington, D. C., April 20, 1942.

BENJAMIN TRUE GAULT, Member (1885), aged 83, died at Glen Ellyn, Illinois, March 20, 1942.

WHARTON HUBER, Member (1915), aged 64, died at Philadelphia, Pennsylvania, March 12, 1942.

HON. GEORGE SHIRAS, 3rd, Life Member (1907), aged 83, died at Marquette, Michigan, March 24, 1942.

EDWARD ROYAL WARREN, Member (1902), aged 81, died at Colorado Springs, Colorado, April 20, 1942.

DR. CASEY ALBERT WOOD,¹ Life Member (1917), aged 85, died at La Jolla, California, January 26, 1942.

GEORGE JOHN CLOUT, Associate (1939), died at St. Catherines, Ontario, May 11, 1941.

REV. FRANCIS H. CRAIGHILL, Associate (1938), died at Rocky Mount, North Carolina, October 14, 1941.

¹ For obituary notice, see *Auk*, 59: 611-612, 1942.

- HENRY CORBIN FULLER, Associate (1916), aged 63, died at New Haven, Connecticut, August 26, 1942.
- ROBERT A. GILBERT,² Associate, aged 71, died at Cambridge, Massachusetts, January 7, 1942.
- DR. ROBERT W. HEGNER,³ Associate (1901), aged 62, died at Baltimore, Maryland, March 11, 1942.
- DR. GEORGE STANFORD HENSYL, Associate (1941), died in his 56th year at Mahanoy City, Pennsylvania, July 27, 1942.
- ALVAH HENRY BEDELL JORDAN, Honorary Life Associate (1888), died in his 77th year, at Everett, Washington, May 31, 1942.
- DR. MARCUS WARD LYON, JR., Associate (1922), aged 67, died at South Bend, Indiana, May 19, 1942.
- JOHN SMITH MAIN, Associate (1926), aged 66, died at Madison, Wisconsin, November 1941.
- MRS., CHARLES WOODBURY MELCHER, Associate (1922), aged 67, died at Homosassa Springs, Florida, December 1941.
- ROBERT LEE MORE,⁴ Associate (1921), aged 68, died at Vernon, Texas, September 6, 1941.
- MRS. CHARLES KELLER (CARRIE S.) REED, Associate (1925), aged 90, died at Worcester, Massachusetts, in 1942.
- PROF. FRANK SMITH,⁵ Associate (1909), aged 85, died at St. Petersburg, Florida, February 3, 1942.
- ELLISON ADGER SMYTH, Honorary Life Associate (1892), died at Salem, Virginia, August 19, 1941.
- JAMES DOUGLASS TURNBULL, Associate (1927), died at Vancouver, British Columbia, November 7, 1941.

² For obituary notice, see Auk, 59: 467, 1942.

³ " " " " " 59: 612-613, 1942.

⁴ " " " " " 59: 468, 1942.

⁵ " " " " " 59: 613-614, 1942.

FINANCIAL REPORT OF THE TREASURER FOR THE YEAR ENDED
SEPTEMBER 30, 1942

RECEIPTS

	<i>For Year Ended Sept. 30, 1942</i>	<i>For Year Ended Sept. 30, 1941</i>
Membership dues:		
Current year	\$2,090.50	\$2,904.00
Previous years	122.00	58.50
In advance	192.00	2,208.00
	<u>\$2,404.50</u>	<u>\$5,170.50</u>
Subscriptions to 'The Auk':		
Associates-elect	237.00	204.00
Institutions	633.89	661.70
Other individuals	21.43	72.10
	<u>892.32</u>	<u>937.80</u>
Sales of publications:		
Back numbers of 'The Auk'	600.60	401.35
1931-40 Index	463.50	.....
Previous indices	66.00	.....
Check-lists	74.00	40.49
Authors' reprints	238.07	192.31
Miscellaneous	22.50	53.00
	<u>1,464.67</u>	<u>687.15</u>
Contributions to:		
Publication of 'The Auk'	347.65	30.00
General expense	15.56	161.39
Endowment Fund	706.50	1,006.00
Purchase of War Bonds	676.50	.....
Denver Committee's expenses .....	.....	150.00
Endowment Committee's expenses	185.00	.....
	<u>1,931.21</u>	<u>1,347.39</u>
Life Membership fees	450.00	300.00
	<u>450.00</u>	<u>300.00</u>
Income from investments:		
General Endowment Fund	621.77	669.24
William Brewster Fund	317.37	347.25
Ruthven Deane Fund	203.83	223.03
Educational Fund	22.75	24.67
Bird Protection Fund	44.48	47.56
	<u>1,210.20</u>	<u>1,311.75</u>
Advertising income (net)	115.75	\$221.35
	<u>115.75</u>	<u>221.35</u>
Total receipts for fiscal year	<u>\$8,468.65</u>	<u>\$9,975.94</u>

DISBURSEMENTS

	<i>For Year ended Sept. 30, 1942</i>	<i>For Year ended Sept. 30, 1941</i>
Publishing and handling of 'The Auk,'		
Manufacture and distribution:		
October, 1st quarter.....	\$1,758.53	\$1,081.63
January, 2d quarter.....	1,469.69	1,067.43
April, 3d quarter.....	1,167.49	1,001.15
July, 4th quarter.....	1,083.81	1,263.94
	<u>\$5,479.52</u>	<u>\$4,414.15</u>
Editor's honorarium.....	600.00	600.00
	<u>600.00</u>	<u>600.00</u>
Reserve stock of publications		
Services, postage, supplies.....	53.29	146.49
	<u>53.29</u>	<u>146.49</u>
Purchase of back numbers of 'The Auk'	72.00	114.75
	<u>72.00</u>	<u>114.75</u>
Total disbursements in connection with publishing and handling of 'The Auk'	<u>6,204.81</u>	<u>5,275.39</u>
Expenses of Treasurer and Bus. Mgr.:		
Secretarial service.....	803.75	599.75
Office expenses and supplies.....	149.86	161.66
Postage and express.....	179.89	84.76
Telephone and telegraph.....	40.55	9.44
Bank charges and foreign exchange...	46.68	81.88
Miscellaneous.....	43.65	27.15
	<u>1,264.38</u>	<u>964.64</u>
Expenses of Secretary:		
Secretarial service.....	135.93	55.80
Postage, mailing and telephone	16.27	54.73
Printing.....	4.20	129.00
Office supplies.....	2.70	28.17
Miscellaneous.....	3.50	19.83
	<u>162.60</u>	<u>287.53</u>
Addition to principal of General Endow- ment Fund:		
Contributions, unrestricted.....	706.50	1,006.00
Contributions, War Bonds.....	581.00	.....
Life Membership fees.....	450.00	300.00
	<u>1,737.50</u>	<u>1,306.00</u>
Disbursements from income of restricted funds:		
Printing, Endowment Committee....	183.49	.....
Educational Fund.....	.....	72.00
Bird Protection Fund.....	.....	15.23
Brewster Memorial Award:		
Honorarium.....	287.10	332.25
Cost of Medal.....	30.27	15.00
Cost of Medal (prepaid).....	30.00	.....
	<u>530.86</u>	<u>434.48</u>

	<i>For Year ended Sept. 30, 1942</i>	<i>For Year ended Sept. 30, 1941</i>
Contributions:		
Zoological Society of London.....	25.00	25.00
International Committee on Nomen- clature.....		10.00
Local Committee's expenses.....		150.00
	<u>25.00</u>	<u>185.00</u>
Total disbursements for the fiscal year	<u>\$9,925.15</u>	<u>\$8,453.04</u>

RECAPITULATION
(as of September 30, 1942)

Assets:		
Cash on hand.....	\$ 25.00	
The Northern Trust Co. (Checking).....	415.69	
The Northern Trust Co. (Savings).....	449.46	
Bank of Montreal (Savings, at U. S. current rates).....	152.77	
	<u></u>	\$1,042.92
Accounts receivable.....	259.24	
Less 10% reserve.....	25.92	233.32
	<u></u>	<u>\$1,276.24</u>
Liabilities:		
Accounts payable.....	0.00	
Addition to principal; Gen. End. Fund, contri- butions, War Bonds.....	95.50	
Dues collected in advance.....	192.00	
Restricted funds.....	449.46	
Advance sales of 1931-40 Index.....	463.50	
	<u></u>	<u>1,200.46</u>
Net current assets.....		<u>\$ 75.78</u>

The above report, audited by Arthur Young and Company, was accepted by the Council, on behalf of the Union, at its annual meeting on October 12, 1942.

I would like to point out that, in contrast to previous years, a relatively small number of dues was paid in advance prior to the end of the fiscal year. This was due to the fact that bills for dues could not be sent out before the election of the new Treasurer.

The generous response of the members of the Union to the appeal of the Endowment Fund Committee is reflected in the contributions shown in the report. Additional contributions were being received up to the close of the period under review. These are tangible results of the fine work of the Committee, and I believe that they will continue

to be received for a long time. Certainly of equal importance are the intangible results. Although not to be regarded as contributions, more Life Memberships were taken out in this period than in many years previously. Mr. McIlhenny's very generous and continued support of the publication costs of 'The Auk' is another expression of the widespread response of the members to the brochure, signed by the President, in which the Committee set forth its program and policy with respect to the finances of the Union.

Those who had contributed to the General Endowment Fund up to September 30, are:

The Nuttall Club	Theodora Nelson
Francis H. Allen	Ralph A. O'Reilly, Jr.
Dean Amadon	Dorothy Sawyer
Elting Arnold	Lydia Schlenker
George R. Clark	Mrs. Hugh M. Smith
Stanley Cobb	Mrs. Rowland Thomas
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The program of giving to the Union specifically for the purchase of War Bonds to be added to the General Endowment Fund was enthusiastically received, and gifts are continually coming in. Those who had contributed to this fund up to September 30 are as follows:

Randolph Ashton	Mrs. Jane S. Elliott
Mrs. Edward Ayer	Francis A. Foster
Rollin H. Baker	Mrs. W. W. Grant
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William C. Vaughn
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Francis M. Weston
George Willett
R. S. Woods

Masao Yatsushashi

The annual report of the Investing Trustees on the condition of the Endowment Fund as of September 30, 1942, was accepted by the Council on behalf of the Union at the annual meeting in October. This report shows the capital assets of the Union to be conservatively invested in securities whose average yield (*September 30, 1942, market value/income 1941-1942*) was slightly better than 5.6%. It should be pointed out that the program of consolidation of the several Endowment Funds of the Union as adopted in 1939 is now fully effective. The maximum use of capital, that safeguards the value of the individual funds and provides an equitable distribution of income among them, is responsible for the high yield, which has been rising since the inception of the program and has now reached the level hoped for. The book value of the Endowment Fund as of September 30 was \$32,912.98, this having increased by reason of the additions to the General Endowment Fund in the financial statement. Contributions of \$95.50 toward the purchase of War Bonds, received during the last three days of September could not be gotten into the hands of the Investing Trustees in time for their annual audit but will be transmitted during the present fiscal year.

The four years of my office as Treasurer have been both strenuous and pleasant and I feel sure that the members will accord my successor, Mr. J. Fletcher Street, the support and patience that they have always shown me.

RUDYERD BOULTON, *Retiring Treasurer and Business Manager*

REPORT OF THE COMMITTEE ON BIRD PROTECTION, 1942

The Bird Protection Committee presents its 1942 Report, the fourth in an America at war. This unfortunate condition is encompassing birds as well as men in its disastrous embrace. For years to come the war or its aftermath is likely to affect many species of American birds. Throughout this 1942 report, and perhaps through several of its successors, the War will form an ever-present background.

This Committee believes that the job of winning the war is of primary importance, not only to preservation of our country but to ultimate conservation of such resources as our bird life. In the process, losses are inevitable. Some losses will be necessary and therefore worth while. Others will be unnecessary and wasteful. Conservationists must try to differentiate between the two—then strive to avoid the latter without hindering the war effort.

One destructive and needless step, based on the excuse of wartime emergency, seems likely to have far-reaching effects on conservation. This is the removal of the Fish and Wildlife Service from Washington. The isolation of the technical wildlife agency of the federal government at a distance from the seat of that government and from the offices of many related activities promises little good. Already the loss of trained personnel is serious. Especially alarming is the prospect that facilities for research are likely to be reduced to the vanishing point.

The conservation work of the National Park Service and the Office of Indian Affairs has also been interrupted and seriously hampered by transfers of those agencies to a point distant from Washington.

A recent legal opinion, holding that Indians on certain Indian lands are not subject to regulations issued under authority of the Migratory Bird Treaty Act, has somewhat hindered the wildlife conservation program that was begun on Indian reservations in 1941. Resultant practices on some Indian reservations have encouraged disregard of waterfowl regulations by neighboring whites. Conservationists who have read the opinion, however, doubt that it is sound, and there are indications that it may be reversed.

This Committee feels that among the major publications on American birds appearing during the past year the following are worthy of special mention. Bent's 'Life Histories of North American Flycatchers, Larks, Swallows, and their allies'; Mayr's 'A systematic and

faunal list of the birds of New Guinea and adjacent islands';¹ Lehmann's 'Attwater's Prairie Chicken, its life history and management'; Ridgway and Friedmann's 'Birds of North and Middle America'; Hellmayr and Conover's 'Catalogue of birds of the Americas and the adjacent islands (part 1, number 1)'; another notable achievement is the publication of the greatly revised 'Birds of North Carolina'; by Pearson, Brimley and Brimley.

We can recommend also that A. O. U. members obtain and read—and then act upon—'Fading trails: the story of vanishing American wildlife.'

Work of Organizations

Much of the important bird work of the Fish and Wildlife Service was continued this last year although drastic curtailment of research had already commenced. Waterfowl flyway biologists accumulated the information on which shooting regulations are based. Reestablishment of pure strains of wild turkey in the Southeast was encouragingly successful. Studies leading to good waterfowl-management practices in coastal marshes of Louisiana were completed. A five-year study on means of coördinating mosquito control with wildlife conservation was concluded. Numerous experiments in handling waterfowl food plants were made. In the field of wildlife diseases, measures for the control of infectious rhinitis in quail were developed. Despite reduced funds and labor, work on the fourteen million acres of refuges under the Fish and Wildlife Service made good progress. Most of the waterfowl nesting refuges were in better condition than ever before, and several had adequate water for the first time since their establishment.

Biological work on National Forests and National Parks was severely cut during the past year as a result of reduction of funds and loss of personnel. Protection has also suffered, although not seriously as yet, due to enlistments, the draft, and transfers of men to other war work. Few important changes in the areas administered by these two bureaus have occurred recently. Present progress on acquisition of lands for the Big Bend National Park, Texas, promises that this project will become an actuality within a few months. Some important desert species, including several rare or absent elsewhere in the United States, will receive protection.

Bird protection by the Soil Conservation Service is accomplished largely through improvement of habitat on agricultural land as a result of soil and moisture conservation operations. Strip cropping

¹ This important work does not deal with American birds.—Ed.

is known to increase the number of ground-nesting birds, while protection of woodlots from fire and livestock as well as regulations of grazing on western ranges have been shown to double bird populations. Stream bank plantings, revegetation of gullies and galled spots, contour hedges, and field borders for erosion control increase well distributed habitable edge on farmlands. These and other standard practices have been adopted wherever feasible by about 250,000 farmers and ranchers cooperating with the Soil Conservation Service in 736 locally constituted soil conservation districts throughout 41 of the United States. Cooperators have built more than 15,000 farm ponds to date, most of which are fenced and serve as small bird refuges; many of them, as in the Great Plains, are along major flyways where they supplement large waterfowl refuge lakes. Plans have also been made for 7500 additional ponds. Protection and management of marshes for production of muskrats, as part of the well integrated farm plan, afford havens for birds. During the past year such land use adjustments directed toward holding soil and saving water have been extended to about 100,000,000 acres in more than 200 newly formed soil conservation districts. Inasmuch as soil conservation practices are known to increase crop yields ten to thirty per cent, it is reasonable to suppose that there will be little lessening of bird protection through soil conservation during the war and post-war years to come.

Significant results obtained by the National Audubon Society during the past year include:

(1) Completion of monographs of the Ivory-billed Woodpecker and Roseate Spoonbill based on field studies by James Tanner and Robert P. Allen, respectively. These include comprehensive summaries of all previously known work and many new facts concerning the life histories of these two rare birds. It is hoped that these two publications will lead to action to conserve and restore the abundance of the species.

(2) Completion of field studies of the California Condor by Carl Koford. Preparation of the monograph unfortunately has been delayed by his call to service in the Navy.

(3) Sponsorship and financing of field research in Florida of tick-deer relationship, by Herbert Stoddard and Edward and Roy Komarek. This is a cooperative effort with the Federal government to find the facts on the basis of which the current controversy regarding the deliberate kill of deer in Florida may be settled. A report is due in the near future.

(4) A new sanctuary in Greenwich, Connecticut, with maintenance fund, constitutes the largest single gift ever received by the National Audubon Society. Unhampered by personal restrictions, the property is stated to be ideal from the standpoints of research and nature-educational requirements.

(5) The Audubon Nature Camp was kept running despite wartime restrictions on transportation. Applicants for the last session of the summer had to be turned away for lack of accommodations.

(6) The Audubon Wildlife Tours were operated in California, Florida, and South Carolina, but temporary abandonment in 1943 is probable because of rubber, gas, and other restrictions. These tours, though as yet reaching only a limited number of people, are believed to stimulate conservation thought and practice.

(7) Negotiations with landowners at Cape May Point, New Jersey, resulted in greatly enlarging the Witmer Stone Wildlife Sanctuary. It now includes all of the wooded area in which many birds concentrate and in which the shooting of hawks has been notorious.

(8) The feather trade in New York was again carefully checked for observance of existing Federal and State plumage laws.

(9) Every effort has been made to maintain sanctuary warden service in spite of inevitable inroads on personnel for the armed services. The 1942 crop of young birds successfully raised to flying maturity at the Audubon sanctuaries was one of the largest.

SPECIAL SPECIES

Great White Heron.—Reports have been received of a definite increase of this species, as well as a possible extension of the nesting range to the northward. Although subject perhaps to greater human hazards, establishment of colonies north of the present restricted range in Florida Bay is greatly to be desired as insurance against total destruction by hurricane. We are advised that military restrictions prohibit an aerial census this year, but the number using the Federal refuge during May to August, 1942, was estimated at 1,800 birds.

Roseate Spoonbill.—The successful nesting of 1941 was apparently repeated in 1942. In fact, the previous record of approximately 800 nests on the National Audubon Society's Second Chain of Islands Refuge near Aransas Island may have been exceeded this year. Some 2,000 Spoonbills and about 600 nests were estimated on the Vingt-un Islands in Galveston Bay.

Considerable damage to Spoonbill habitat in southern Texas was wrought by the hurricane of September 1, 1942. A number of important nesting islands were much reduced in size by wave action,

and many high shrubs preferred for nesting purposes were swept away or beaten to the ground. Some late-hatched young, and even adult Spoonbills and members of the heron group, were destroyed.

Waterfowl.—The increase in most species of ducks is good news. The Fish and Wildlife Service estimates that the stock of ducks and geese now totals about 110 million birds, or almost four hundred per cent increase over the number in 1935. This, together with an expected decline in hunting pressure as a result of the war, perhaps justifies the relaxation of the 1941 shooting regulations. However, we are yet to be convinced of the desirability of extending the daily closing time from 4 p. m. to sunset. The results of extension of shooting privileges should be carefully watched.

We are informed that the duck population in eastern Canada during the past summer was normal. In the eastern part of the breeding range in the Prairie Provinces, conditions were the best in twelve to fifteen years. Water-levels greatly improved, and the majority of lakes and sloughs carried the heaviest duck-breeding population since the years prior to the great drought. Mallards, Pintails, Baldpates and Lesser Scaups occurred in abundance; Shovellers and Blue-winged Teal varied markedly. Redheads, Ruddies and Canvas-backs showed a perceptible increase but were still low in numbers.

Further west on the prairies of Canada, conditions were spotty and many localities continued poor.

Waterfowl enjoyed an excellent year in western Alaska. The birds arrived early, produced good broods of young, and the normally small kill by natives was unusually low due to a shortage of ammunition. Mallards, Pintails, Scaups and Shovellers were markedly increasing in numbers, while Baldpates and Greenwinged Teal were only holding their own. Eiders (especially Steller's Eider) were abundant. Most species of geese did well. This was not the case farther east in northern Canada, and the total supply of geese, with the exception of Blue Geese, has declined.

In passing, we have received information that shorebirds were very plentiful last summer in western Alaska. The Pacific Godwit, Pacific Golden Plover, Black Turnstone, Pectoral and Red-backed Sandpipers, and the phalaropes were most abundant.

This Committee adopted a policy of watchful waiting toward the legalization of hunting of the Wood Duck. The effects of a strictly limited bag appear to be no more harmful than the violations of the previous prohibition.

Nene or Hawaiian Goose.—With the spread of the war to Hawaii,

renewed fears were expressed for the safety of the Nene. Most of the population of this rare goose is in confinement on ranches and game farms on the Islands, where it would be subject to use for food in the event of invasion or of effective blockade. Thorough investigation by officials of Hawaii National Park resulted in the decision that, because of grave difficulties of transportation, an attempt to move some of the birds to the mainland should not be made at this time. It was also learned that the number of Nene living in the wild state may be larger than the previously estimated total of 50 birds.

Trumpeter Swan.—The count of Trumpeter Swans conducted in August, 1942 by field personnel of the Fish and Wildlife Service indicates that the population may have increased slightly. Their census included 161 birds, as compared with 152 in the previous year. During the past two years, three cygnets from the Red Rock Lakes Refuge were placed with three adults previously stocked in Jackson Hole, Wyoming, and one adult and four cygnets were transferred to the Malheur Refuge, Oregon, where two adults had been liberated. Emergencies arising from forest fires prevented the annual swan count in Yellowstone National Park. Judging from records of swan numbers on the same lakes in 1942 and in 1941, the Yellowstone population of adult swans and cygnets has not decreased.

An interesting note on the Trumpeter Swan in western Canada was received recently. In the winter of 1940-41, Indians in the Driftwood River Valley of British Columbia reported that swans were very scarce on Middle River and Trembleur Lake, where they had been common for some years previously. The Indians also stated that decidedly fewer swans than usual were seen during the 1941 spring migration. These observations were confirmed by reliable white observers. It is hoped that this report of sudden scarcity in the Driftwood River Valley indicates nothing more than a shift of population to other localities. Dominion wildlife authorities believe that the situation "continues satisfactory."

Federal waterfowl regulations this year prohibit the taking of Snow Geese in Beaverhead, Gallatin, and Madison Counties, Montana, as well as in Idaho which was closed last year. This should remove the last possible excuse of "an honest mistake" for the shooting of a Trumpeter Swan in the United States.

California Condor.—Systematic records of the California Condor have been continued by the Forest Service for several years. It is definitely believed that the range of the birds has been extended and

that their numbers have increased. As an example, nine Condors were watched for four hours on July 15, 1942 from a Forest Service fire lookout station near Sequoia National Park in the southern Sierra Nevada. Four other separate sight records of Condors were reported during July in this general locality. Fish and Wildlife Service field men later reported seeing fifteen in one day.

We are informed that early in 1942 Mr. Donald McLean of the California Division of Fish and Game obtained a motion picture of 65 Condors. Within sight at the same time was another group of 15, making an astonishing total of 80 Condors!

The Forest Service believes that illegal killing of Condors has been reduced to a minimum. At the request of the War Department, the entire Los Padres Forest has been closed to public entry and specifically to deer hunting. It will be interesting to see if benefit to the Condor results, although Forest officers believe that killing occurs chiefly in feeding areas outside the Forest. To combat this poaching, the Forest Service has carried on an educational campaign aimed at the rural population. It is felt that this program has been beneficial and, if carried further, will help in saving the Condor from extinction.

The Grouse.—This is the peak year of the ten-year grouse cycle from Alberta to the Lake States, and perhaps further. One experienced Canadian observer wrote last autumn: "Sharp-tailed and Ruffed Grouse have recovered. I have already seen them thicker and that, too, I believe, applies right across the prairie provinces." Many states, including Wisconsin, are celebrating the event by lengthened open seasons. In our opinion, this will do no harm at least to Ruffed Grouse. During a peak year the hunters in the north woods do not make an appreciable dent in the population. With Sharp-tailed Grouse and Prairie Chicken the wisdom of a long season is more debatable.

The prairie grouse of this region, and perhaps other regions, are confronted by a widespread infiltration of pheasants into their range. Last year the kill of Ring-necks in central Wisconsin, formerly a pure grouse country, far exceeded the kill of grouse, and heavy pheasant planting continue to be made. No one knows yet under just what conditions pheasants and grouse compete, neither does anyone know that the present mixing policy is harmless. One encouraging bit of news reaches us from Alberta, where Sharp-tails are numerous despite a record-breaking abundance of Hungarian Partridges. The same question of interference has long been de-

bated there. We reiterate our belief that efforts spent in raising and releasing exotic game birds would be more profitably spent for research and habitat improvement to encourage natural propagation of native game birds.

Whooping and Sandhill Cranes.—From all indications, it appears that the status of the Whooping Crane is more precarious than ever. There are few recent reports of the birds in summer in Canada, where remnants of the species still nest. Fewer birds were recorded on the Gulf Coast wintering grounds and the small proportion of immature birds is alarming. Only fifteen birds, of which two were immatures, were noted on the Aransas National Wildlife Refuge in the winter of 1941-42. There is a possibility that airplane activity in the vicinity of the refuge is a contributing factor in the present reduced use of the refuge by cranes. Use of adjacent coastal islands and marshes by the Army Air Corps as bombing and machine gun ranges has reduced the available crane wintering ground on the Texas Coast. Oil-well production in marshlands and bay waters and increased activity on the Intra-Coastal Waterway no doubt cause considerable additional disturbance.

The number of Whoopers present in the marshes of southern Louisiana has declined. There is evidence of the wanton killing of at least two cranes in the past year. Two birds spent the winter of 1941-42 on the Sabine National Wildlife Refuge in southwestern Louisiana and a migrant pair spent a short period at the Kit Carson National Wildlife Refuge, Colorado.

Great numbers of Sandhill and Little Brown Cranes have been observed in migration periods in central and western Nebraska and at points north and south of this area. On the basis of these and other observations through the west the total population runs into many thousands.

Woodcock.—The 1941 open season on Woodcock is repeated this year practically unchanged. The state of New York again enjoys a total of 45 open days and the eastern United States a total of 65 open days. The status of the Woodcock has improved but little since the disastrous season of 1940. We are disappointed that restrictions, urged last year, were not adopted.

Wilson Snipe.—Continuation of the closed season on Wilson Snipe in the United States is advisable. Although said to be abundant last summer in western Alaska, the species seems to be steadily declining in numbers. A reliable and experienced observer finds it decidedly less numerous than several years ago, and believes that a

drastically shorter hunting season and lower bag limits in the Maritime provinces would be desirable. A completely closed season would be still better.

White-winged Dove.—Our 1941 report discussed at some length the White-winged Dove problem in the United States. According to the latest information, little improvement has taken place during the past year. Little can be expected, probably, until nesting-ground refuges can be acquired, on which protection from the chief bird predators (two species) might be given. Hunting pressure, also, seems a factor of some importance to the eastern White-wing. Even the short (five half-days) season in Texas should be eliminated. According to our information, the 15-day season in Arizona results in a negligible kill due to earlier migration of the bulk of the dove population.

Mourning Dove.—Based on findings of a "very material shortage of the eastern form of the Mourning Dove," the 1942 season in fourteen eastern states has been reduced to 30 days, instead of 42 days as in 1941. The bag and possession limits also have been reduced slightly. It remains to be seen whether these restrictions will markedly lower the kill. Loss of even a small percentage of the dove population by this preventable cause seems regrettable in view of the depleted status of the species.

For the first time in many years, hunting of Mourning Doves has been permitted in Oregon. Careful study is needed to determine the ability of the species in that state to withstand shooting for a 15-day period with bag- and possession-limits of 10 birds.

Band-tailed Pigeon.—Ability of this species to stand up under a 30-day open season has been questioned by some authorities. The tendency to collect in flocks during the fall, to perch stolidly even when disturbed, and the slow reproductive rate, combine to make the species highly vulnerable.

Ivory-billed Woodpecker.—The latest reports on this vanishing species and its habitat are discouraging. Few birds have been seen during the past year. Under the impetus of war demands, timber-cutting on the Singer area in Louisiana has picked up speed. More than half of the tract, one of the possible two or three remaining habitats, now has been destroyed. The extinction of this species within a comparatively short time seems inevitable.

PREDATORY BIRDS

Little information has come to this Committee regarding the Bald Eagle population trends after two years of legal protection in the

United States. In Alaska, lack of funds for bounty payments has discouraged control practices. Intensive naval patrolling of the Alaskan coast may mean some additional destruction of eagles.

An example of predatory bird 'control,' continued after any possible need had vanished, was called to public attention in the June, 1942 'Monthly Bulletin of the Texas Game, Fish and Oyster Commission.' Although antelope in the Trans-Pecos district have increased to the point that surplus stock is removed for repopulating other areas, Golden Eagles are still being killed systematically. A warden of the Commission describes his personal accounting for 1338 eagles since April, 1930, by poison, steel trap, rifle and shotgun. Four hundred of these birds were killed from an airplane.

BIRDS IN WAR

Peace-time losses of pelagic and coastal birds due to oil have been multiplied enormously by the war. Peterson ('Birds and Floating Oil': Audubon Magazine, 44, no. 4: 217-225, 1942) ably reviews the dismal picture on the Atlantic coast. He concludes that "while the war lasts, it seems totally improbable that we can prevent oil pollution at sea. When, however, the conflict is over, not only should public opinion force strict enforcement of existing laws against pollution within the three-mile limit, but every effort should be made to gain international agreement to ban oil pollution on the high seas."

Information on occurrences affecting birds in military areas of the Pacific islands is not available, and in any event could not be published. One has the gravest fears, however, for the unusual bird communities of the islands such as Wake and Midway and possibly others. In the western Aleutians, the several races of ptarmigans on heavily occupied islands may be wiped out. They are readily taken and fresh meat is rarely provided by army rations in such remote places. The actual kill of waterfowl is not likely to be heavy, for the rifle is not an effective bird gun. The normal migration of waterfowl through the Aleutian Island chain may be affected, however, and the wintering and nesting birds will be much disturbed in places due to military occupation.

Construction of the Canadian-Alaskan Defense Highway holds some immediate dangers for wilderness wildlife within a limited distance of the right-of-way. More widespread damage may arise after the war as a result of this new accessibility of several fine wilderness areas. Trumpeter Swans, mountain goats, bighorns, grizzlies, moose and caribou are some of the noteworthy animals inhabiting the region. It is hoped that American and Canadian authorities

will unite in a common plan for orderly sensible use of the highway and of the areas traversed.

MYSTERIOUS BIRD MORTALITY ON WASHINGTON COAST

A rather spectacular and unexplained loss of birds occurred in May, 1942, on the coast of Washington between the Columbia and Quinault rivers. Of some 18 species affected, the great majority were California Murres and Pacific Loons. On the basis of counts on a sample mile of beach, the total loss was more than 20,000 birds. There was no evidence of oil, and due to advanced decomposition of the carcasses, proper examination was impossible.

RECOMMENDATIONS

The Committee on Bird Protection repeats its Number One recommendation of 1941 and places it again at the head of the list for 1942:

1. Information on military projects that would appear detrimental to *important* bird habitats should be sent at the earliest possible moment to the Fish and Wildlife Service, Chicago, Illinois.

2. The drastic curtailment of federal funds for essential wildlife research should cease. The movement toward unwise economies should be over-ruled by a common-sense standard of relative values.

3. Many of the efforts now expended in raising and releasing exotic game birds should be diverted instead to research and habitat improvement to encourage natural propagation of native game birds.

4. We repeat that market restrictions of the hunting kill of the Woodcock and Eastern Mourning Dove is imperative. A closed season on the Eastern White-winged Dove in Texas and on the Wilson's Snipe in eastern Canada is advisable.

CLARENCE COTTAM

WILLIAM L. FINLEY

ALDO LEOPOLD

VICTOR H. CAHALANE, *Chairman*

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JOHN T. ZIMMER

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